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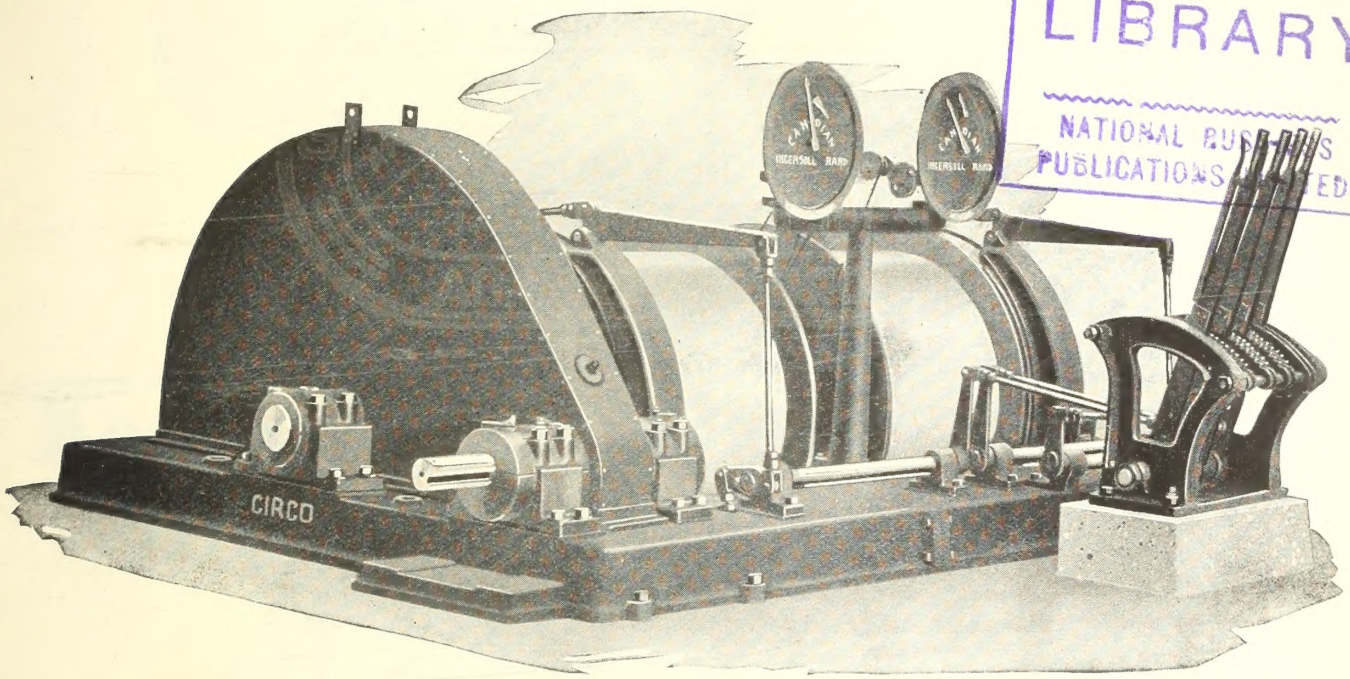

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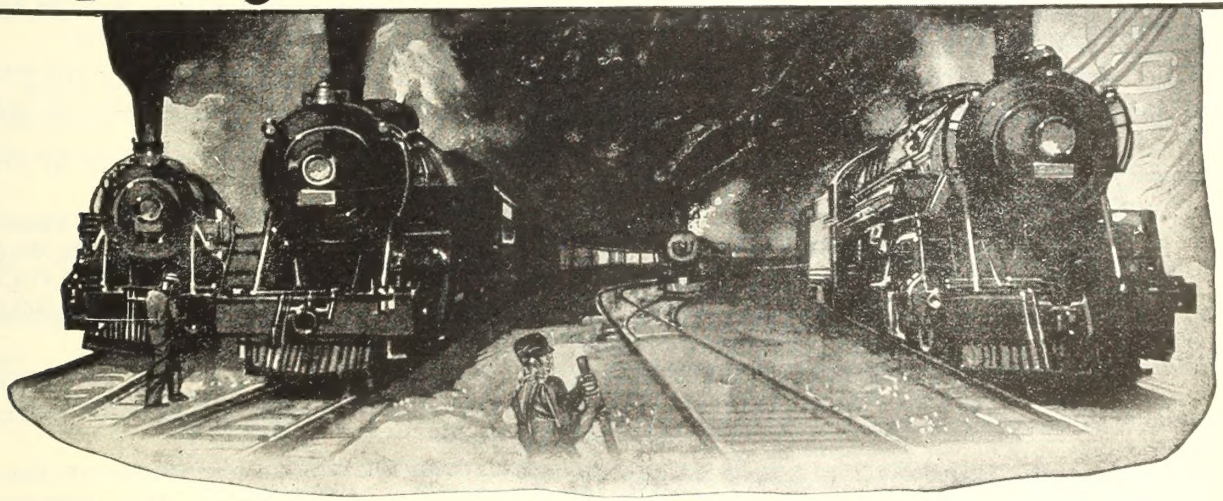

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In addition to the above, practically all economic minerals (coal and tin excepted) are found in Ontario:—actinolite, apatite, arsenic, asbestos, cobalt, corundum, feldspar, fluorspar, graphite, gypsum, iron pyrites, lead, mica, molybdenite, natural gas, palladium, petroleum, platinum, quartz, salt, talc and zinc. This Province has the largest deposits on the continent of talc, feldspar, mica and graphite.

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Preliminary returns show the output of the mines and metallurgical works of the Province for the year 1921 to be worth $48,128,387,of which the metallic production was $27,574,202.

The following figures show the rapid growth of Ontario's mineral industry by five-year periods since 1891:

Year.	Value.	Year.	Value.
1891	$4,705,672	1906	$22,388,383
1896	5,235,003	1911	41,976,797
1901	11,831,086	1916	65,303,822

Dividends.

Dividends and bonuses paid to the end of 1921 amounted to $23,140,734 for gold mining companies, and $84,388,185 for silver mining companies or a total of $107,528,919.

Mining Regulations.

A miner's license costs $5.00 per annum, and entitles the holder to stake out in any or every mining division three claims of 40 acres each. After performing 200 days' assessment work on a claim, patent may be obtained from the Crown on payment of $2.50 or $3.00 per acre, depending on location in unsurveyed or surveyed territory.

Assay Office.

The Provincial Assay Office at No. 5 Queen's Park, Toronto, is maintained by the Department of Mines for the free identification of minerals, free assays under the provisions of the Mining Act of Ontario, and also for general assay work as per the Schedule of Charges which may be obtained on application.

Temiskaming Testing Laboratories

The Department maintains, at Cobalt, an ore sampling and testing laboratory which is now prepared to receive parcels of gold ore from 100 pounds upward, and after sampling and assaying the same to pay to the shipper the value thereof, less treatment charges. The purpose is to afford a market for ores extracted by prospectors and others in developing their mining claims, enabling them to obtain funds which they can use for further work and to report on the most satisfactory method of treatment. Fuller information may be obtained on application to the Manager, Temiskaming Testing Laboratories, Cobalt, Ontario.

Publications.

For list of publications, illustrated reports, geological maps and mining laws, apply to

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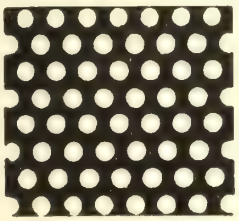

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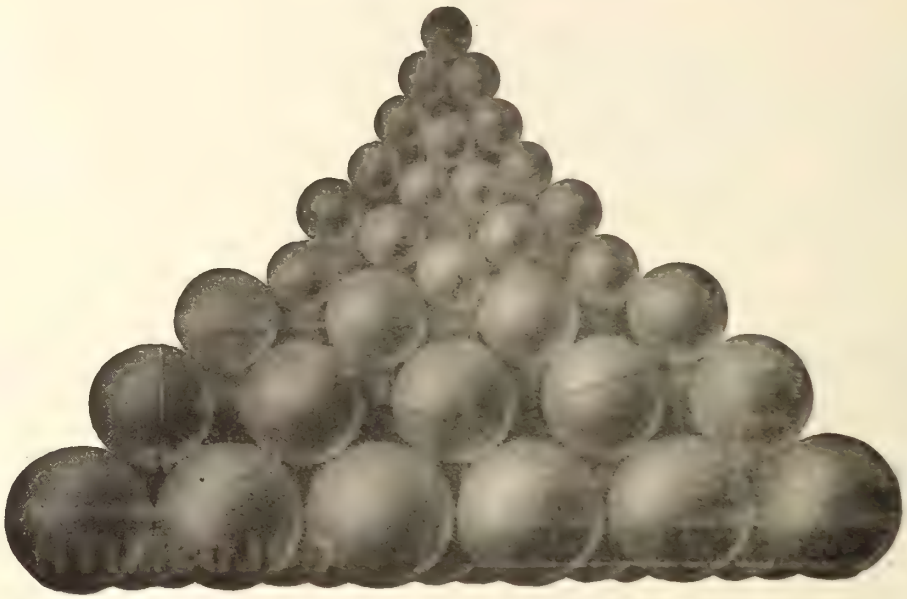

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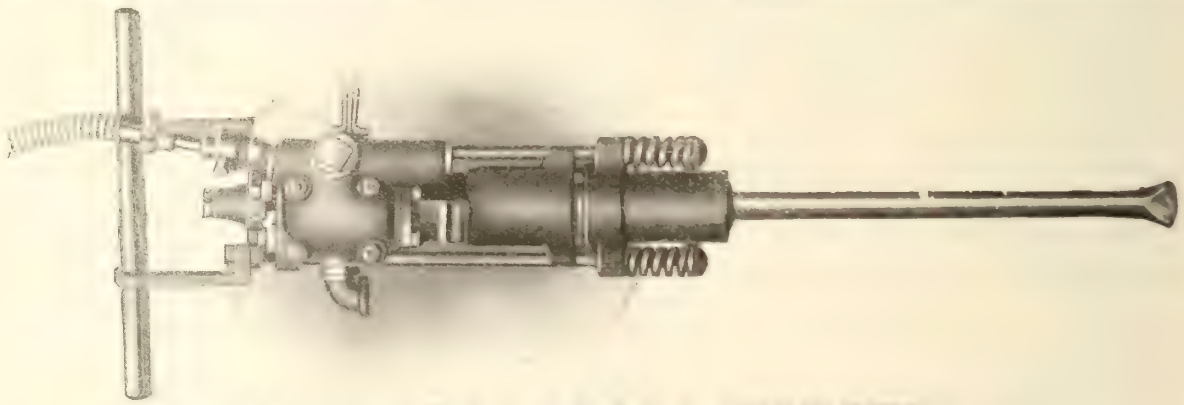

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:-: EDITORIAL :-:

CANADA'S MINERALS AT THE BRITISH EMPIRE EXHIBITION

Canada's mineral industry will be represented at the British Empire Exhibition in London next year by an exhibit that will surpass in excellence anything heretofore attained. Our Dominion government was slow to ratify the final arrangements for Canada's share in the Exhibition; but since the official announcement was made, practical measures have been formulated and put into effect with such thoroughness and despatch as to ensure a Canadian exhibit of which we shall be proud.

The Canadian exhibits are to be housed in a building 400 feet by 200 feet, one-half of which is alloted to industrial exhibits and the other half to natural resources. The mineral exhibit has been assigned one wing of the latter section, a space 80 feet by 110 feet, with an additional space in the adjoining broad aisle. The building is to be of temporary construction, and work on it has been commenced under the direction of Mr. A. W. Tolmie, Canadian Government Exhibition Commissioner, who left for London with a staff some weeks ago to initiate the work. The building was designed in Canada and is being built by the Dominion Government. A large part of the material, as for instance the marble used for decorative purposes, will be sent from Canada.

The mineral exhibit is designed to represent Canada's mining industry from coast to coast. The general arrangement of the exhibits will be geographical, so that the visitor can commence at one end with the mines and quarries of Yukon and British Columbia and, as he walks, view in succession the mineral wealth of the prairie provinces, Ontario, Quebec and the Maritime provinces. Within these geographical divisions the arrangement is, however, directed by the natural association of the minerals; silver-lead-zinc, gold-copper, natural salts, nickel-copper, silver-cobalt, asbestos and chrome, and coal exhibits, for instance will each be grouped. Within these groups the individual specimens or groups of specimens from specific mines or mining camps will be labelled to show their point of origin and will be adequately described.

As it is not possible to provide as an integral part of these exhibits all the information about Canada's mineral industry it is desirable to convey to visitors, a special book is to be prepared by the officers of the federal Department of Mines. It will contain appropriate descriptions of Canadian geology and of our mineral deposits and will include a special map.

The proprietors or managers of mines and quarries throughout the Dominion have been invited by the Mineral Division of the Canadian Government Exhibition Commission to send exhibition specimens of their ores and minerals to the headquarters in Ottawa. Specimens from 50 to 250 pounds in weight are requested, though case samples 6 by 8 inches are acceptable also. These specimens may be from producing mines or from prospects. The Commission asks the coöperation of all those in a position to provide these specimens, that the collection may be as fully representative and as interesting as possible. Freight charges will be met by the Commission.

The cases that will enclose the larger part of these exhibits are ranged along the three walls of the space allotted, a total of 270 feet. They are twelve feet in height, and are surmounted by Canadian wall marble, above which, in the cornice, are illuminated mining scenes, 10 feet by 3½ feet, printed photographically on translucent linen and coloured by hand. In the centre there will be floor cases. A special ceramic exhibit, now being prepared by the Ceramic Division of the Mines Branch, will occupy 40 feet of wall space in the adjoining aisle.

The officer of the Exhibition Commission in direct charge of the mineral exhibit is Mr. W. D. Dalgleish, who has acted in a similar capacity at all Dominion Government mineral exhibits for the last twenty years. It is as a result of this long experience that it has decided the exhibit shall represent Canada as a whole, though there will be a provincial division in the arrangement as outlined above. A few weeks ago Mr. Dalgleish visited the provincial mining authorities from Victoria to Toronto, arranging for the complete coöperation of each, and now is engaged in a similar tour of the remaining eastern provinces. By this means he has engaged the aid of those most competent to make the Canadian mineral exhibit at the Exhibition an outstanding success.

CARBONISING PLANT FOR CANADA

While scores of fuel specialists throughout the world are busily engaged searching for a solution of the domestic fuel problem by way of the low-temperature carbonising of non-coking coal, and while hundreds more are just as busily engaged in argument as to the merits of processes proposed or under investigation, a practical business man has decided to put one such process to the test. Mr. Henry Ford is reported to have under construction at Walkerville, Ontario, a

carbonising plant designed by Messrs. Emil Piroy and Ralph D. Lamie. The problem is one of vast importance — even more important than the coking of coal for domestic use, as most bituminous coal is non-coking, and the yield of by-products is greater by the low-temperature process.

The numerous serious attempts to solve the carbonisation problem, both in Canada and elsewhere, are fully warranted by its importance. Its solution would be not merely of national but of world-wide importance. Particularly is it of importance to us in this country, with our deficiency of high-grade fuel as well as of motor fuel. If, by reason of the genius of these two inventors and the business acumen of Mr. Ford, the problem should be solved on Canadian soil, it will help notably to swell the meagre total of our present industrial research and may even stimulate the concerted and consistent work of investigation in many branches of industry which alone can ensure a full reward to Canadian workers and investors.

NO SIGN OF GRACE

The science that deals with human life will always take precedence over its sister sciences. It appeals to every mortal man, and to most of us in a very personal way. Death and disease are facts that obtrude themselves upon even the most obtuse. Research in medicine has, therefore, an appeal to the popular imagination that is enjoyed by no other line of investigation.

We join heartily in the congratulations being accorded our legislators in Ottawa on account of their well-judged action in the case of Dr. Banting. His successful search for a cure for diabetes warrants the most generous reward the nation can bestow upon him, and the annuity of $7,500 voted by the Commons is merely a fitting token of our appreciation. Titular honours are no longer accredited in Canada, else Dr. Banting would enjoy the privilege of knighthood as well.

We cannot join fully, however, in the chorus of approval, for part of it is undiscriminating. Our present parliament is not at all notable for discrimination, nor yet for positive action. The annuity to Dr. Banting is, we take it, a lucky stroke, impelled by a fortunate accident of circumstance rather than by a stated policy. In few other instances has our principal governing body shown discrimination in spending the national funds it holds in trust. It costs our legislators nothing to make this most appropriate acknowledgment of our debt to Dr. Banting; *we* foot the bill. Many times the amount of this annuity is pocketed, without proper legal warrant, by members of parliament who have raised their own sessional indemnities by an extra thousand dollars.

No—we can discern no sign of grace in Parliament's recognition of our distinguished young Canadian doctor. When they shall have followed this with the establishment of a national institute for research, and shall have saved the annual cost of this and many other such paying investments by means of the honest and economical administration of our national income, then we shall be ready to say, "Parliament is reformed! Parliament has developed a conscience and good judgment! Long live Parliament!"

MR. DRESSER'S LETTER

Today we re-print a letter from Mr. John A. Dresser to the *Financial Times*. It discusses a question that receives but meagre attention from either mining engineers or the financial public; yet it is a question that warrants the best attention the Canadian mining fraternity can give it, and is of first-rate importance to the general public.

On numerous occasions we have pointed in these pages to the fact that mining investment is as yet almost totally unorganized. Vast sums of money pass each year in the name of mining that never reach mine or mill. A large part of this is available for honest and discriminating mining investment if we, the mining men of Canada, will take the pains to go and fetch it It is good money, else the promoters of dishonest "mining" ventures and the purveyors of bogus stocks would not be so anxious to get hold of it.

Mr. Dresser ends his letter with a question. He asks whether the people that are fleeced at present by means of illicit and injudicious issues of mining stock are capable of protection. We would reply that, were an alternative to the present dubious or worthless issues of stock available, a substantial fraction of the present investors would choose it. The main benefit to the mining industry would not come, however, from these. It would come from the many investors who have now the impulse to put their money in mining ventures, but who can find at present no accredited agent to whom they can entrust their funds. It is principally for this reason that we urge the establishment of a mining brokerage house to which both prospectors and investors can turn with the implicit confidence that they will get a "square deal."

We hope that Mr. Dresser's lead will be followed by other mining men that have the welfare of their industry at heart. The public discussion of mining investment presents an opportunity for public service.

THE QUEBEC REPORT

The 1922 report of the Quebec Bureau of Mines is unusually full of interest. Mr. Denis' warning under the caption "Mining Ventures and the Public" follows up his own policy of years past, and exemplifies as well the expressed attitude of Premier Taschereau and his colleagues. Mr. Taschereau has promised recently that he will follow up his interest in this mat-

ter by introducing legislation designed to curtail the operations of the stock-selling rogues that now infest the province. Quebec is now almost unique in having no statutes whose express intention it is thus to protect the public. We hope that the Bureau of Mines report for 1923 will record the passage of an adequate and judicious "blue sky" law.

Two outstanding features of the report are the included reports by H. C. Cooke on the Opasatika map area, and by F. J. Alcock on the Gaspé zinc-lead deposits. The report on the new gold area is particularly interesting, as it has not yet been published in its original form. Both reports are by officers of the Geological Survey, and are printed in the Quebec report with the Director's permission. This, of itself, is a most excellent and useful arrangement; but it draws attention to a state of affairs in Quebec that we hope will receive speedy attention.

The Bureau of Mines is now, and always has been, the orphan of the executive community of Quebec. It receives little consideration and less financial support from the provincial government. This is in spite of the fact that the mineral industry is bound to become the principal industry of the province, whose arable land constitutes a smaller proportion of its area than any other province. Fortunately this fact is beginning to penetrate to the consciousness of the political executives. When they become more fully conscious of the position of prime importance the mineral industry must assume in their province, we can expect rapid and effective action. For years past Mr. Denis, struggling to cope with the situation, at first single-handed and now with a totally inadequate staff, has said that a gold mining boom in Quebec would effect a metamorphosis in the attitude of Quebec legislators. The boom has come, and the fulfilment of his prediction will follow.

THE ASBESTOS MILLS

Today we print the first article of a series by Mr. Ernest Booker on the Quebec asbestos field. Mr. Booker dwells on the recorded fact that a large part of the asbestos in the rock as quarried is lost in the process of milling. In a subsequent article he will show how, by comparatively simple means, most of this waste can be avoided.

In the 1922 report of the Quebec Bureau of Mines, the present wasteful milling method is referred to in no uncertain terms. The mill in Thetford of the Asbestos Corporation is referred to thus: "A new dust set-
" tling chamber has been erected on the west side of
" the mill. By this means, it is said, over 80 per cent.
" of the dust which formerly escaped outside and
" polluted the air, is now collected, bagged and sold.
" Some five tons per 24 hours is thus collected." This refers to the mill that was burned recently. The mill now under construction will, no doubt, include the improvement added to the old one.

The mining and milling practice of the Quebec asbestos field has remained strangely impervious to many of the influences that make for progress. During recent years some obvious waste of time, material and energy has been curtailed; but much remains to be done along this line. In former years this waste merely reduced the scale of profits, since the field enjoyed virtually a monopoly of the world's markets, and prices were almost what the operators chose to charge. This is far from the case today, particularly with the longer grades of fibre, as is evidenced by the fact that crude No. 1 dropped in value from $1,281. in 1921 to $648, in 1922, and crude No. 2 from $446. to $265. Some competent students of the asbestos market predict that the prices of long fibre will drop still more, which will remove our asbestos pits still further from the bonanzas of former days.

The plain fact is that, if Quebec is to hold even a fair share of the world's asbestos markets, the pits and mills must be operated with the utmost economy. Otherwise, and quite unnecessarily, the province will lose the larger part of its principal mineral industry, as well as a substantial revenue, and the prosperous communities round about the quarries will gradually assume the gloomy and disheartening appearance of the deserted mining town.

Last week the bill authorizing the bounty on copper rods and bars contained in Mr. Fielding's budget passed the Commons. There was some opposition to it, mainly from Western members, who wanted to see proof that the bounty is really required. Happily, this opposition was overcome by a substantial majority, and the copper industry will receive the reasonable measure of aid required to establish it soundly.

CANADA

Anniversary

In humbleness, O, Lord, we ask
That Thou should'st fit us for the task,
  The duty, and the privilege, of giving
Our best to work we have in hand;
That of ourselves we may demand
  The constant effort after worthy living.

Let not our pride of country, race,
Or power, for one brief day efface
  Remembrance of the debt we owe the past;
Let not self-interest or greed,
But service, be our living creed,—
  Lord, may we cherish good and hold it fast.

May we our heritage transmit
To children who are strong and fit
  To treasure it far better than have we;
O, help us play the part of men,
That, when we pass, our children then
  May love and honour Canada and Thee.

ANON.

The Nation's Birthday

By A. R. R. JONES, Editor, Journal of Commerce

On Monday of this week we celebrated Dominion Day with grateful hearts. And, indeed, in this favored land — a nation in itself and yet one of the galaxy of nations that surrounds the British Throne — we have much reason for gratitude.

Our natural resources are of vast extent and varied and manifold in character. First in importance is the soil devoted to agriculture. In Eastern Canada mixed farming, dairying and fruit growing are firmly established industries, but not more than half of the estimated area of 110,000,000 acres fit for agriculture in Eastern Canada is at present used for that purpose. The excellent railway service enjoyed by this part of the Dominion, the rapid improvements that are being made to the highways there, and the fine location of its ports all render easy the cheap and rapid transportation of agricultural products for delivery to home and foreign markets. In Western Canada, although the agricultural industry, as we are constantly reminded by those engaged in it, is not without its own pressing problems, yet the three Provinces of Alberta, Manitoba and Saskatchewan have been dowered with agricultural resources sufficient to support at least five times their present population. In fact, in these three Prairie Provinces, only about 18 per cent. of the total area of land with cultivation possibilities has, thus far, been put under crop.

Next in importance to the products of the farm are the products of the forests. This country possesses the enormous area of 1,800,000 square miles of forests. This, however, when considered from the standpoint of commercial material is reduced by one half, since there are extensive areas in the subarctic and subalpine regions that do not support trees of sufficient size or in sufficient quantity to make their utilization profitable, even for pulpwood. Thus the forest area, from the viewpoint of commercial material, must be considered as reduced to 900,000 square miles. And, during the past seventy-five years, at least one half of this commercial forest area has been burned, and most of it not once only, but several times. Thus we have today about 450,000 square miles of forest yielding commercial timber, that is to say, sawlogs and pulpwood. Dean Howe, of the Faculty of Forestry, Toronto University, estimates the total forest resources of Canada at 553,750 million feet board measure of saw material, and 1,297 million cords of pulpwood. These resources, even though reduced as above, constitute a magnificent heritage, and it is satisfactory to know that Canada is recognizing that in her forests there is a great source of wealth needing conservation and development to the utmost.

In the great nickel, copper, silver and gold deposits of Ontario; the copper, gold, lead and zinc deposits of British Columbia; the asbestos and gold deposits of Quebec; in the mineral potentialities of the great hinterland of Northern Canada; in the gold and copper ore bodies of importance which are being developed in Northern Manitoba; in the coal deposits of Nova Scotia, Saskatchewan, Alberta and British Columbia; Canada possesses vast mineral wealth which is bound to play an increasingly important part in the country's growth and prosperity.

Few countries possess waters that afford such scope for gigantic commercial fishing enterprises as do those of Canada. This country, unlike so many other lands, is not hemmed in by the territories of other peoples, but is, on three sides, bounded by the salt sea water, while inland it is traversed by many streams and rivers which take their rise in thousands of lakes, among which are some of the greatest bodies of fresh water in the world, practically all of them abounding in fish. Both the deep-sea and inshore fishing grounds are of vast extent. Among deep sea fishing grounds must be mentioned the famous "Grand Banks" of the North Atlantic from Labrador to the Gulf of Maine; the Gulf of St. Lawrence; the Bay of Fundy; and the Pacific fishing grounds estimated at from 100,000 to 150,000 square miles in extent. The inland fishing grounds include the Canadian portion of the Great Lakes and the countless rivers and lakes occurring from east to west and north to the Arctic seaboard, the total approximating to some 200,000 square miles in extent.

Another source of natural wealth with which Canada has been phenomenally blessed is her water-powers. There are installed to date throughout the Dominion water-wheels and turbines to the extent of 2,909,659 horse-power. However, it would not be correct to place this figure in direct comparison with the minimum or maximum available power figures and therefrom deduce the percentage of the available water-power resources developed to date. An allowance must be made for the average ratio between water-wheels installed and the power available. An analysis of the water-power plants scattered from coast to coast, concerning which complete information is available as to turbine installation and satisfactory information as to stream flow, gives an average machine installation of 30 per cent. greater than the six-month flow maximum power. Applying this, the figures quoted above therefore indicate that the

at present recorded water-power resources of the Dominion will permit of a turbine installation of 41,700,000 horse-power. In other words, the present turbine installation represents only 7 **per cent** of the present recorded water-power resources. The 2,909,659 horse-power at present installed throughout the Dominion is apportioned to the following uses: (1) 2,144,870 horse-power in central electric station for general distribution purposes, such as operation of street railways, operation of mines, operation of electro-chemical and electro-metallurgical industries, operation of pulp and paper mills and for general industrial, municipal and domestic use. (2) 484,228 horse-power installed in pulp and paper mills. In addition there is used in the pulp and paper industry 160,577 horse-power purchased from the central electric station installation: and (3) 280,561 horse-power installed in industries other than central electric stations and pulp and paper mills.

Such, in barest outline, are some of the natural resources in the possession of which we are so signally fortunate. This possession it is which must (humanly speaking) inevitably determine that, provided the resources in question are understood aright and used properly and economically (in the best sense of the word) Canada will occupy an increasingly important place among the nations of the earth — at any rate, on the material side. We are fortunate, further, in the fact that our opportunities, insofar as the upbuilding of a great country is concerned, are still nearly all in front of us. We have much to learn — and we must learn much — from other and older lands and notably from one land, the most majestic, as she is the most motherly. We can learn from them in the realm of art, of literature and of science, and especially as regards the last-named, in the matter of the application of scientific education to the advancement of agriculture and nearly every other industry. Moreover, we are able to learn much, not only from their accomplishments, but also from their mistakes. Some blunders Canada has made in the work of nation-building — but they have been, for the most part, blunders incidental to, if not inseparable from, a pioneer condition. But as yet they are none of them irretrievable blunders. In one respect, at least, we are, as yet, happy. In our cities, so far, slum conditions as they are known in London or New York or Liverpool or Chicago, have not established themselves — conditions which are the certain breeding-grounds of unemployment, want and vice. In Canada, we have the opportunity to build up a State in which the whole body of citizens will be able to lead clean and decent lives, shorn of none of the necessaries of life and permitting of time and space for appropriate recreation and spiritual and mental improvement. None of the economic evils that afflict older countries has, as yet, got a stranglehold on Canada. Let us see to it that none of them does.

On this, the Dominion's birthday anniversary, it is inescapable that Canadians generally should be in reflective mood. As we have said, our national heritage is one of magnificent extent, and vast and varied resources. But material wealth and resources do not make a nation. It is five years now since the termination of the war in which the young manhood of Canada conferred an undying lustre on her name. How have we met the test of the years of peace since then? Better than some other countries, no doubt. But they will be superficial judges, indeed, who will say that, as a people, we have met those years in a spirit worthy of the devotion of those lads who gladly gave their lives for a noble cause. We have somehow largely missed the inspiration to unselfish service that we ought to have derived from the blood-stained fields of France and Flanders.

Do we not still, the majority of us, place a false estimate — and one as unsatisfactory as it is false— on the tawdry glories of wealth and on the pleasures that wealth can bring? Are the big interests, on the one side, and organized Labor, on the other, less selfish and self-seeking than of yore? Do our Governments display any more predisposition than of old to initiate constructive legislation for the benefit of the whole people? Have we made any solid and substantial progress in the formation of an honest public opinion? Are we more ready, individually and collectively, to give willing and useful service for the common weal, to subordinate private or sectional interests to the common good? Are we less prone to measure individual merit and national progress alike mainly in terms of dollars? In a word, are our civic ideals loftier, our personal ambitions less ignoble?

Let us ask ourselves such questions as these — and answer them honestly. In that case, there is little doubt that we shall realize that, in spite of the manifold blessings that Providence has granted us, there yet remains much to be done ere we can worthily tread the path of true national greatness or worthily fill the place Nature seems to have assigned to this favored and fortunate land.

GARNET AS A PRECIOUS STONE

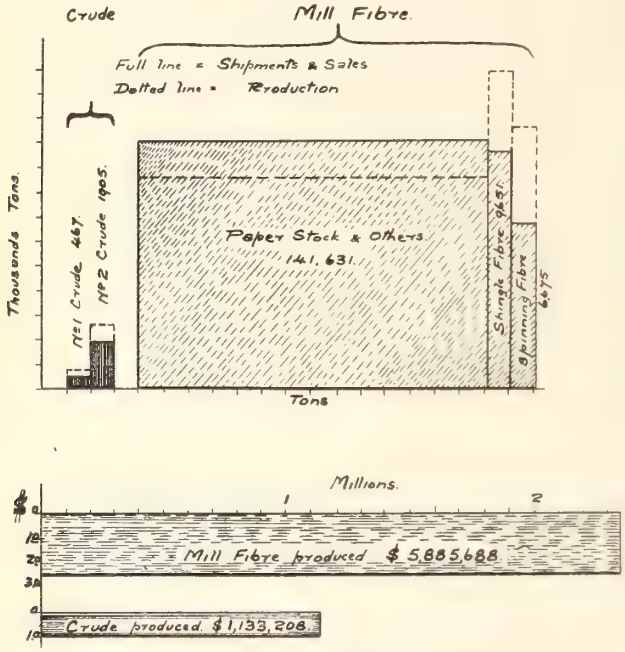
Garnet crystals are sometimes perfect and often enough to be of value as gems. Most of the varieties of garnet are used as gems when transparent crystals are found. Jewellers use red and yellowish brown garnets under the name "hyacinth." Garnet crystals can be recognized by their roundish shape and their hardness. Good crystals may be found in schists, particularly mica schist and chlorite schist, in slate, in crystalline limestone and serpentine near contacts with igneous rocks, in pegmatite granite, and in gneiss. Beautiful crystals are found in mica schist along the Stickeen River, B. C. Green chrome garnet of gem quality has been found in Oxford, Ontario. Very fine gem garnets have sold for as much as $50.00 each. Good crystals of one carat weight have been valued at from $1.00 to $5.00 each. (One carat is about 3 1/3 grains)

The Quebec Asbestos Industry

1. — Losses in the Milling of Asbestos

By ERNEST BOOKER

In the past, the asbestos industry in the Province of Quebec has been largely a crude fibre business, with the mill grades of fibre as a secondary consideration. While crude fibre has been unquestionably the most profitable, to a large extent this business has now gone elsewhere, due to the discovery and development of new ore-bodies in different parts of the world. The importance of the



Comparison of Production & Demand for Canadian Crude, & Mill Fibre 1922.
based on Mines Report 1922. Province of Quebec

Fig. 1.

business in mill grades of asbestos fibre is therefore obvious. Fig. 1. graphically shows the comparison of the two during the past year. In 1921 the business done, while small, was much of the same order.

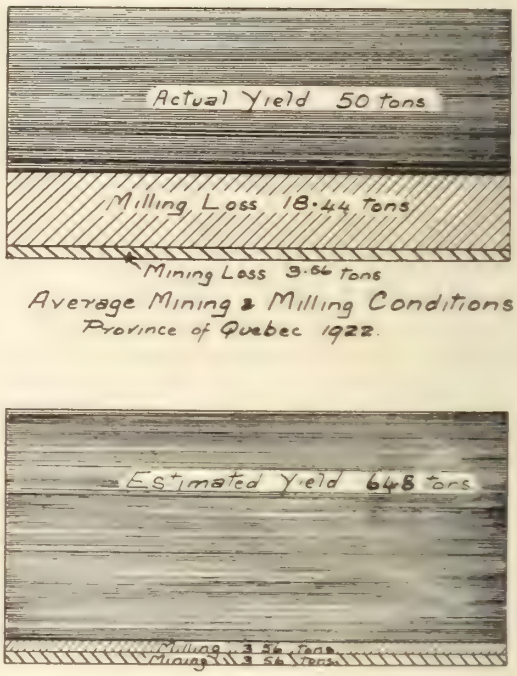
Future Profits are in Mill Fibre

It will be noticed in Fig. 1. that while the production of crude fibre exceeded the sales and shipments, the opposite occurred in the mill fibre business with the exception of two grades; the production of asbestos paper fibre being considerably below the sales. It is therefore to the mills that we must look for the most profitable business in the future.

Possibly there are some who, while knowing their mills are not efficient, do not realize what the inefficiency means in actual loss of fibre production or yield, and its value in dollars and cents. Where a mill is not doing all it can be made to do, things must change, and change rapidly, or this mill fibre business will also go elsewhere.

30 per cent of Fibre Now Lost

At the present time there are many losses in the mills in operation, and of course while it is hardly possible to mill and get 100% efficiency or fibre extraction, yet the actual milling efficiency can be greatly increased. From information gathered recently, it appears that the average efficiency of the mills in the Province of Quebec is about 70% and in some cases is as low as 50%. To illustrate this appalling state of affairs, Fig. 2. shows approximately the loss of fibre taking place daily, for every thousand tons of rock milled. Note that this is something over 18 tons, whereas the actual fibre loss in the mining of the ore is about one-fifth of this quantity. One cannot avoid fibre losses in the mine, especially if it is of the



Average Mining & Milling Conditions
Province of Quebec 1922.

Efficient Milling Conditions

Estimated Loss of Asbestos Fibre per 1000 Tons of Rock.

Fig. 2.

open-cut type; but in the mill, losses can be largely eliminated, and must be if the Quebec asbestos industry is to prosper.

From the same chart, Fig. 2, you will notice that with efficient milling conditions the mill losses are estimated at about 3 1-2 tons per thousand tons of rock milled.

Losses are in Dumps and Dust

To find where the losses actually occur in the process of milling must be the first step in considering an improvement. About half the mill loss can be put down to inefficient separation of the rock and fibre in the mill, which results in a considerable quantity of fibre going to the tailings dump with the rock. The other half of the fibre lost in the mill is not in any one place, but is scattered about the surrounding countryside with the dust that pours from every window, door and crack in the mill building. Now, it is quite a problem to collect asbestos fibre from the surface of the land, but it is a simple matter to prevent the leakage of this dust and fibre at its source in the mill.

In many cases it is no individual machine or type of machine that is at fault, but the arrangement of the mill as a whole. In any case the losses can be reduced and much more profitable operation result.

Increased Profit Possible

Having pointed out the importance of the mill grades of fibre from a business standpoint, and the losses that are now occurring in the production of these products in tons of fibre per day, it is only reasonable to give a little attention to the value of the losses and what the increased recovery would mean in revenue. Fig. 3. shows graphically just what may be expected in the production of mill fibre and its value, compared with the actual production and revenue for 1922. Both diagrams are based on the same tonnage of mill rock.

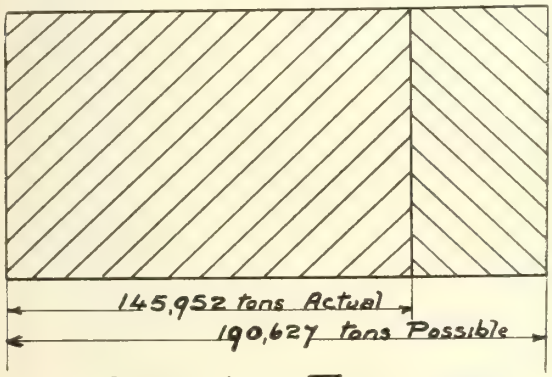


Fig. 3.

The increased revenue from the increased fibre production does not, however, equal what the mine and mill owners actually lose by the operation of an inefficient mill, or possibly an efficient mill operated uneconomically. In addition to the actual revenue from the increased fibre produced, the cost of 25% of the mill rock at the mill must be accounted for, since one is separating virtually no fibre from this quantity of ore when using an inefficient mill. This cost, amounting as it does to quite a respectable sum daily, is lost daily, is lost sight of, or rather one should say is included in the mining and milling cost of the other 75% of ore. The unit costs of mining and milling thereby become inaccurate and the actual unit costs are unobtainable. This discrepancy, while passing unnoticed, reflects no credit on the management and in many cases seriously handicaps both the mine and mill managers, to say nothing of the owners themselves.

Wasteful or inefficient milling of any mineral can find no justification in Canada, and appears to be either downright folly or close-fisted ignorance; because by inefficient milling one rejects that margin of profit which in many cases would increase the business standing of the industry, and the harmonious working of those whose livelihood it is.

Re-treating Tailings will be Difficult

The problem that will unquestionably come up at a later date will be the possibility of re-treating tailings to recover the fibre left in them. Asbestos in its mill grades is not a particularly high-priced product, and so it will be very questionable if the revenue from such re-handling of tailing dumps can be profitable. In some cases where milling has been carried out in only a slipshod way, the fibre content might be sufficiently high to pay its way if the market price for such grades of fibre were to appreciate considerably. On the other hand re-handling tailings might never be a profitable proposition; but preventing the loss of fibre would make such re-handling unnecessary.

A Plea for Economy

At a recent lecture before the Royal Society of Arts, Sir Richard Redmayne, Chairman-Governor of the Imperial Mineral Resources Bureau, pointed out the possibility of the exhaustion of certain minerals within the British Empire during the next few years, and while this possibility may be remote with regard to asbestos, yet it is only fair to mining companies and everyone else, that operators do their best to stop both the wasteful or inefficient mining and milling of any mineral.

The milling of asbestos is essentially a mechanical process, and like similar mechanical problems its efficiency can be raised to an economical standard. The present losses can be greatly reduced by both mechanical and electrical means. Reduced losses and increased production are what all should work for, since the attainment of these objects brings both a financial reward and the satisfaction of a job well done.

A fibre and dust-covered countryside, a mountain of tailings here and there containing asbestos fibre to the value of millions of dollars, the ultimate recovery of which will probably prove unprofitable, are not the legacies to hand on to posterity, who might with every justification refer to them as the monuments of the inefficiency and folly of the engineers and mine proprietors of this decade.

PERSONAL AND GENERAL

Mr. S. N. Graham, who is doing field work for the Anglo-French Exploration Company, recently returned from a trip to Rouyn Township in Northwestern Quebec, and has again taken to the field after a week in town.

Mr. Harry Stewart, Manager of the Crown Reserve Company, has been forced by ill-health to leave on an extended holiday. Maurice W. Summerhayes, Consulting Engineer of Toronto, will be in charge of the Company's property during Mr. Stewart's absence.

Mr. E. R. Wood, one of the best known financial men in Toronto, was recently appointed a director of the Northern Canada Power Company. Mr. Wood is President of the Dominion Securities, Limited, who recently purchased a $1,500,000 6½ per cent first mortgage bond issue, which is a joint obligation of the Northern Canada Power Company, the Lower Sturgeon Power Company and the Quinze Power Company. Of the proceeds approximately $3,000,000 will be used in the development of 20,000 h. p. at the Quinze, and $1,200,000 for the retirement of the Northern Canada Power Company's bonds due next January, and the balance for the completion of the Lower Sturgeon plant.

Mr. Newton W. Emmens has been elected a Member of the Association of Professional Engineers of the Province of British Columbia (Mining) and has been retained by the British Petroleums Limited (of Canada) as their Petroleum Engineer and Technical Adviser. Mr. Emmens has recently examined and reported on their leases and operations in the Wainwright field of Alberta. His headquarters are in Vancouver.

J. A. DRESSER DISCUSSES MINING INVESTMENT

The *Financial Times*, Montreal, has stimulated some public discussion on the question of investment in mining securities by the small investor—a matter that is of prime importance to the mineral industry. To last week's issue, Mr. John A. Dresser, President of the Canadian Institute of Mining and Metallurgy, contributes the following letter:

The Editor, The Financial Times:

Sir,—In response to your invitation to take part in the discussion of the position of the small investor in regard to mining enterprises, I would say that the subject is a timely one. In both the east and the west of Canada interest in mining is active and is promising substantial results. Besides the operation of established mines, the pioneer work of prospecting is being prosecuted vigorously, and in consequence there is increasing opportunity for the use of capital, especially in new mining projects.

Your question as to how the small investor may judiciously share in such enterprises has been well introduced by W. M. Goodwin, the editor of the *Canadian Mining Journal*. In a letter to your columns of May 26th. Mr. Goodwin points out that the small investor who cannot afford to thoroughly investigate for himself the projects offered has at best only a random chance of success. Although willing to take a fair share of risk, providing good faith is assured, he is without fair opportunity to inform himself and really only takes chances.

This, of course, is not investment, nor even reasonable speculation. He suffers, too, from a popular idea that any degree of security in mining undertakings is impossible. This belief is probably due in the first place to experience and observation of enterprises of a needlessly ill-judged character, and secondly to unfamiliarity with the means available and the steps necessary to value a mining investment. It may also be fostered by unaccredited salesmen who either do not know better, or do not want their enterprises investigated. Yet, as a matter of fact, a body of ore can in most cases be proven as to its content and value as definitely as the bases of other commercial enterprises, and when so proven is an asset certainly of no less security than a timber limit or a stock of merchandise.

As a safeguard for the small investor, Mr. Goodwin suggests some form of co-operation between established brokerage houses on one hand and reliable technical advisers on the other in order to provide adequate investigation and information for the investor. It is not clear why co-operation between various financial houses should be advised, unless in cases requiring greater financial effort. Otherwise divided liability may mean either divided counsel or lessened responsibility and attention.

As to the other features of Mr. Goodwin's suggestions, there can be no dissent, they appear to be only a general application to mining undertakings of the practice of responsible houses in the case of their commercial enterprises, as the promotion of power developments, manufacture or mercantile projects.

It is common knowledge that in Great Britain or in the United States, for instance, certain brokerage houses have successfully specialized in mine financing, and have retained public confidence. Even in Canada mining operations are sometimes conducted by some of these firms, through the joint action of their financial and their technical staffs.

It is rather rarely that established Canadian brokerage houses take up mining issues in Canada. But it may be in time that they could do so to a greater extent, and with both profit to themselves and greater security to those who wish to apply small sums to legitimate mining operations. This, and whether or not there is sufficient capital in such hands as to warrant undertaking such a course on a broad basis, are questions for the financial rather than the technical man to answer. If feasible, and carried out in a thorough and duly precautionary manner, it would be constructively in the public good.

Lastly, would the small investor avail himself of the opportunity to place his money with greater security, and consequently with less extravagant promise of profits, or would he still favor the lurid dreams of the wildcat promoter?

Yours faithfully,

JOHN A. DRESSER

Montreal, June 26th, 1923.

FIRE!

The Granby News, a little weekly published by the Anyox Community League at Anyox, B. C., has the followwing striking appeal in a recent issue:

Little cigarette butts,
Ashes from your pipe,
Dropped without a thought, belike,
Where the mould is ripe:
Any little sparklet—
The match you throw away,
May cause a conflagration
You'll rue for many a day.

So sings a fellow worker in a minor key to a nursery rhyme measure. But as good things sometimes come in small packages, there is no reason why there shouldn't be more truth than mere metre in the tenor of such a song. There is; in fact it is all truth, and it would be well for everyone of us to recognize it as such, learn the words of the song and sing likewise. On three occasions the employment of every man in Anyox has been jeopardized by the fire fiend going on a rampage, blazing in all directions, and crowding the residential section as well as the units of production. This may occur again this year, and the thing be accomplished if it gets the proper impetus, no matter how big the effort may be to curb and control the element. The season of summer is with us now, and the excessive heat of the early part of the month brought the fire risk mighty close to us all with remarkable suddenness. There is really no excuse for fires whatsoever; they are absolutely unnecessary except to warm us and drive our machinery, and occur only through the agency of man or a great convulsion of nature. Natural causes contributing to the punishment of the world by fire are of rare occurrence and are beyond our control; but the man-caused fires, which from time immemorial have been responsible for great suffering and tremendous property losses, can be practically eliminated by taking advantage of the sure means possessed by each and every average one of us—the faculty of common sense. Let us cultivate this faculty to the utmost, and it will surely follow that carefulness will creep into our mental councils and be productive of much that is good. Just think about it; and outside of our kitchen stoves let's have a fireless summer.

CONCRETE HEADFRAMES

The new headframes erected at the coal mines in the north of France to replace those destroyed during the war are quite generally made of reinforced concrete. There are numbers of these to be seen now in the regions round Lens and Bethune.

THE QUEBEC MINING REPORT FOR 1922

The final report of the Quebec Bureau of Mines for 1922 is an unusually interesting and useful volume. The statistics for the year have already been presented in preliminary form, and show a mineral industry almost wholly dependent upon non-metallic production, principally asbestos and structural materials. The steady production of the Derry feldspar quarry in the Buckingham district is a bright spot.

An outstanding feature of the report is the definite warning it gives to investors in the pages devoted to "Mining Ventures and the Public." Mr. Denis has followed with good effect the lead given by Mr. Taschereau in warning the public of the crooked mining stock promoter and salesman, and his description of "the insidious literature and glowing statements of agents offering mining shares and beautifully engraved certificates" goes to the mark. The whole statement is very discriminating, and deserves wide circulation in the public press.

Another section draws attention to the various areas of mineral-producing rocks, variously designated as Keewatin, Huronian, etc., scattered throughout the vast areas of granitic rocks in northern Quebec. It is to these areas that prospectors should direct their attention.

The asbestos industry made a notable recovery during the year; but it appears that, in spite of a reduction in price of almost one-half, there is still difficulty in disposing of crude fibre. It is noted, however, that, whereas the sales of crude (long fibre) asbestos from Quebec increased from 6,316 tons in 1921 to 9,047 tons in 1922, the shipments of Rhodesian asbestos continued to decline, being 15,958 tons in 1922 against 21,872 tons the previous year.

Copper mining in the Eastern Townships has ceased, due to the availability of low-priced sulphur for the manufacture of sulphuric acid, for which purpose the copper pyrites was used. There is, however, a new and promising copper occurrence at the headwaters of the York river in Gaspé, which was examined by an officer of the Bureau. Very little work of development has as yet been done on these claims.

Dr. F. J. Alcock's report (Summary report, Geological Survey, 1921, Part D.) on the Gaspé zinc-lead deposits is reproduced in part in this report. Road-building constituted the chief activity of the Federal Zinc and Lead Company during the year.

The principal interest in the report centres on Dr. H. C. Cooke's report on part of the new gold area of northwestern Quebec, which is here published for the first time. While a large part of this report is devoted to the geology of the region, explicit and useful directions are given to prospectors.

The graphite industry continues to languish, due to the war-time stocks in various producing centres that continue unsold, and are being disposed of, it is said, at less than their present cost of production. Not until the price of graphite goes up to a normal figure will it be possible to operate profitably in the Buckingham district, where one of the properties is equipped with a modern mill, ready for operation.

The final section of the report is devoted to a discussion of labour conditions and mine accidents. "It is gratifying to report that there no labour troubles in the Quebec mines in 1922." Mine accidents were at a rate of 46 per thousand men employed, while fatal accidents were at the rate of 2.72 per thousand.

A new tin smelter was put in operation in May at Sydney, Australia, By O. T. Lemprière & Co.

THE IMPERIAL ECONOMIC CONFERENCE

An Australian View

The subjects listed by the Colonial Office for prime consideration by the forthcoming Economic Conference indicate that the present British Government is more alive than any of its predecessors to the necessity of entering into co-operation with the Dominions to promote trade within the Empire. The first five questions scheduled for discussion on the official programme are as follows: — (1) Ways and means of full development of the natural resources of the Dominions, (2) Inter-Imperial commerce and shipping communication generally (3) Co-ordinate action and improvement of technical research (4) Organization of economic intelligence, and (5) Unification of the law and practice in the Empire in matters affecting trade development.

Read in the light of the fact that Great Britain intends to propose an enlarged scheme for the settlement of her surplus population in the Dominions, the items set forth above suggest that she is ready and willing to give sympathetic consideration to the question of reciprocal trading preferences. Britain is now in the position (largely as a result of the war) of being unable to provide employment for her whole working population . The taxpayers of the United Kingdom are feeding upwards of 1,500,000 workers for whom the country is unable to find occupations; but although during the last few months Britain's foreign trade has substantially revived (leading to a great expansion in her manufacturing activities) there is no discernible prospect of improving her industrial situation sufficiently to absorb more than a proportion of the workless mass. In these circumstances her rulers have realized the necessity of transferring the surplus population to countries able and willing to put their services to economic use. Inasmuch, however, as their emigration to foreign lands would weaken Britain without any compensating gain to any part of the Empire, the Imperial Government is most anxious to provide for their settlement in the Dominions.

The Dominions, for their part, are all anxious to increase their vital strength, and would greatly prefer immigrants of their own kin to all others. No Dominion, however, nor all together, could undertake making homes and finding occupations for the large numbers of prospective British immigrants whose fortunes are at stake unless adequate assistance were forthcoming from the Mother Country to assure the future of the immigrants when settled in the lands of their adoption. The Dominions, primarily, are food producing countries. During the last few years they have all (and Australia particularly) developed the secondary side of their industrial life, but not one of the Dominions has yet acquired the capacity to absorb any great or sudden influx of people in its manufacturing activities. Primary production, however, offers an illimitable field. At the present moment, in the whole range of the British Empire, there are only 13,000,000 white agriculturists. When we remember that there are 18,000,000 agriculturists in France and 20,000,000 in Germany, and when we remember further that Britain is dependent on the outer world for more than half her food requirements, it is obvious that a vast scope is offering within the Empire for the development of primary production.

In view of the decidedly sympathetic attitude that Britain is now displaying to the cause of Empire

development, there is real hope that the forthcoming Economic Conference will find a solution of the problems indicated. At previous conferences these problems were at best imperfectly understood, and the sacrifices which the Dominions had made to that end or were prepared to make were disparaged or disregarded. There has been a great awakening in Britain since the war, and not one of her statesmen to-day evinces any disposition to "bang, bar and bolt the doors of Britain" on the trade of the Dominions. On the contrary, they are displaying a lively appreciation of the necessity to discover and enforce a formula of close Imperial co-operation, and they have already give some indication of their conversion to the policy of reciprocity by granting certain tariff preferences to some of the products of the Dominions.

The Commonwealth Government has announced that it will press the necessity for greater preference very strongly at the Conference. We hope that it will succeed. Most economists are agreed that in co-operation and reciprocity resides the surest hope for the solidification of the British Empire, and for its development into the mighty, self-contained, economic fabric which Nature, in her lavish bestowal of her richest resources, seems to have marked out as its destiny. — Industrial Australian and Mining Standard.

A METHOD OF UNWATERING AN OLD PROSPECT SHAFT*

A property was to be examined. It was a prospect in the early stages, and there was beside the usual trenches and assessment-pits, a shaft 125 feet deep, with an 80 foot drift at the hundred and two small overhead stopes above the drift. These workings contained water to within 40 feet of the collar. In addition to removing the water in the workings there was an inflow of 5 gallons per minute which would have to be contended with.

The hoisting equipment for sinking the shaft had been removed, with only a head-frame and its sheave wheel left. To have secured a hoist, even a used one, transport it from town (35 miles), set it up and then, when the unwatering had been accomplished, return the outfit and place it on the market, was an expenditure that would have made the examination an expensive affair. An automobile was essential to convey our party to the property and it occured to us that the mine water might be removed by bailing, with the car, on a "whip."

A 50-gallon iron sinking bucket, and 250 feet of 5-16 wire rope were rented. A hinged trough, and dumping chain, were rigged at the proper elevation in the head frame. The cable was attached to the channel-bar frame of the Dodge car. The cactus and brush were cleared to make a run-way upon which the auto could travel forward and backward to and from the head-frame while journeying the bucket up and down the shaft. The car was faced toward the shaft so that it would be in reverse gear when raising the load. Rocks were put in the tonneau to weigh down the rear wheels. The headlights, together with a shielded lantern in the head-frame, provided adequate illumination for night work. A laborer at the dumping trough was the only hand required beside the auto driver.

Thus equipped and manned, operations were commenced. Without slipping the tires, the car was able to raise the fully loaded bucket of 500 pounds, including the cable, and would do so very smoothly if the bucket were allowed, before the pull and after having filled, to submerge a couple of feet, thus giving the car a start before the bucket reached the surface of the water. Havig raised the bucket into the head-frame, the dumping chain was attached to the ring under the bottom of the bucket, the load eased down, dumped, and picked up again, all without a shift of gears. The weight of the bucket was sufficient to move the car back toward the shaft. However, to hasten the matter, the gear was shifted into forward, low, a kick-off given and then a coast and a breaking as the bottom was approched.. The dirt runway was sprinkled every hour for the first six, and then every two hours. A hard-packed road was early made, and maintained.

Because of the inflowing water, steady operations were desirable. After the first part-day of try-out, the operations were continuous.

We pulled 76,000 gallons of water in 34 hours of hoisting, making as high as 3,000 gallons an hour at times. This work consumed 23 gallons of gasoline, one of light oil and one of heavy.

The shaft was drained, the bottom mucked out and sampled. The hoisting service proved to be a safe and very helpful adjunct to the sampling job.

It is obvious that the cost of this unwatering was decidedly low.

* From Colorado School of Mines Magazine.

INDUSTRIAL ITEMS

The Turbinair Hoist, double drum type, "HDA," of the Sullivan Machinery Co., is described in a comprehensive way in Bulletin 76-D, available on request. The construction of the hoist and its performance are noted, and its many effective uses illustrated and described, particularly "slushing" in mines. Suitable types of scrapers are illustrated by means of drawings. The uses of the single drum type, "HA," are similarly described in Bulletin 76-C.

"Sales Schools" are a recent development of the Link-Belt Company. New salesmen are gathered from the various sales branches at a central point, and these are instructed in their work. They likewise gain a personal acquaintance with the heads of departments and are able to inspect the company's factories and products at these meetings. The third Sales School was conducted early this month in Indianapolis. The former schools have proved to be a paying investment, and no doubt this one will be the same.

The Canadian Ingersoll Rand Co., Montreal, have just issued a new descriptive bulletin covering their Cameron double suction, volute centrifugal pumps. The illustrations are numerous and clearly set forth the special features of these pumps, while the text contains much useful information on the mechanical details, tests, dimension table and part list. The book is known as No. 7350-C, and will be forwarded to anyone interested on application.

TOURMALINE

When in fine pink, red, or green crystals, tourmaline is of value. Gem tourmaline may be found in pegmatite dikes, and at the contact of intrusive granite with crystalline limestone, schists, and gneiss. Crystals of brown tourmaline of gem quality have been found in crystalline limestone in Ross, Ontario, and at Calumet Falls, Clarendon, and Hunterstown, Quebec.

COAL STATISTICS FOR MARCH

The monthly report on coal by the Dominion Bureau of Statistics shows that the output of coal from Canadian mines during March amounted to 1,457,000 short tons, a decrease of 11% from the figures for the previous month but an increase of 12% over the average for the month of the preceding three years. The output for the month in Alberta showed a decrease of 202,000 tons and in Saskatchewan 2,000 tons while the output for British Columbia was the same. Nova Scotia and New Brunswick showed increases of 24,000 tons and 3,000 tons respectively. The cumulative output from all mines for the three months of 1923 amounted to 4,858,400 tons. This figure against the three-year average for the period showed an increase of 22 per cent.

Comparison of the March and February figures covering the importation of coal from the United States and Great Britain showed an increase of 37 per cent. March imports amounted to 1,817,700 tons while the February figure was 1,326,200 tons. The March importations this year were 28 per cent greater than the preceding three-year average for the month. Imports from Great Britain amounted to 22,000 tons during the month. Total importations of all coal for the three months of 1923 was 4,785,600 tons, an increase of 33 per cent above the three-year average for the period.

The imports of anthracite for March totalled 493,400 tons. This figure was 17 per cent higher than that of February and 22 per cent higher than the three-year average for the month. A classification of these imports showed that 442,800 tons of egg, grate, stove, etc. sizes was obtained from the United States and 6,700 tons of the same sizes from Great Britain. The balance of the anthracite importation was of buckwheat and rice sizes, industrial fuel, amounting to 43,900 tons. Of the total anthracite imported during January, 323,000 tons was entered through the ports of Ontario and the balance through the ports of eastern Canada. The total amount imported during the three months of 1923 was 1,337,500 tons, an increase of 34 per cent over the three-year average for this period.

The exports of Canadian coal for the month of March showed an increase of 54 per cent over February figures, the quantities being March, 284,500 tons, February, 185,000 tons. Comparison of the March exports with the preceding three-year average showed an increase of 41 per cent. Exports from the eastern provinces amounted to 146,500 tons, an increase of 59,400 tons over the February exports; those from the western provinces amounted to 138,000 tons an increase of 40,100 tons over February. The cumulative exports for the year to date amounted to 685,600 tons, or is 29 per cent greater than the three-year average for this period.

The tonnage made available for consumption in Canada during March was 2,990,600 tons or 8 per cent more in February when 2,778,400 tons was made available. In comparison with the three-year average, the March tonnage showed an increase of 19 per cent. The total coal made available in the first three months of 1923 amounted to 8,958,400 tons and for the twelve months ending March 31st; 29,419,300 tons. These figures are respectively 27% greater and 8% lower than the three year averages for the same periods.

The total number of men employed in the coal mines of Canada during March was 31,077 of whom 23,228 were underground and 7,849 surface men as compared with 24,075 and 8,222 on surface for February. The production per man was 47 tons for March as compared with 50 tons per man in February. The coal mines of the western provinces suffered severely from lack of orders, a factor which was practically negligible in the east.

NICKEL MINING IN NEW CALEDONIA

The nickel deposits of Noumea occur in serpentine country rock, as do chrome and cobalt as well. There is a somewhat different aspect in the rock containing these metals, so that to the experienced prospector it is easy to know what is likely to be found where he happens to be working, though the writer knows of a body of chrome ore intruding just alongside a large body of nickel ore.

The nickel ore-bodies are found mostly on ridges, the garnierite showing green on the surface, this ore having at first attracted prospectors who were under the belief that they had found copper ore. For some time this green ore was exclusively looked for, and underground mining was resorted to in following the shoots. Later it was found by assay that the dump contained rich ores, in some cases richer than what had been retained for sale. As a matter of fact, nickel mining is mostly an open cut or quarrying proposition, using benches at various levels.

As a rule the ore-bodies are so soft that pick and shovel are the only tools required to begin with. Of course, as work progresses in depth the material hardens, the formation taking a shingly character. Though dynamite is extensively used, it certainly is not the explosive wanted as a general rule. The workmen prefer dynamite, the main reason being that part of the charge is very often kept back in order to be used for fishing purposes. In fact, a large trade in dynamite is done in an illicit way to provide fishermen with their wants in this respect.

It is necessary to test ore values by assay as work progresses, for the percentage of metal varies considerably, and the eye cannot discern the change. The density alone is not a dependable guide, light ores sometimes testing well and heavy ore being poor. The organization of the work is faulty, the ore in some cases being handled many times before being disposed of, and very few of the workers would satisfy the average railway foreman in the use of the shovel.

The ores are now seldom exported, two local smelting works producing mattes, while a third one, controlled by Japanese, has been partly erected; but the finishing touch has to be given, the work being suspended for some time, and at present there is no sign of a move towards its completion.

The nickel deposits of Noumea are of considerable extent and, no doubt, they will be, to this island, the main means of industrial prosperity for years to come, particularly if the metal has new uses, and its metallurgy is simplified. To the writer there seems a possibility of nickel metal being produced on the same lines as copper and at the same price, in which case its industrial future should be exceedingly good. The ores worked range from 5 per cent. upwards; lower grades are put on the dump. The last quotation seen by the writer was 790 francs per 100 kilos, which gives a 5 per cent. ore a value of somewhat about 300 francs for metal recovered. — Industrial Australian and Mining Standard.

The long-continued coal strike in New South Wales has resulted in a shortage of coal, and the State government has begun to distribute its surplus stocks to users.

GEARS

A Description of the Various Kinds, their Characteristics and their Use

(Courtesy of Hamilton Gear and Machine Co., Toronto)

(Continued from page 500)

Gear Drives vs. Belts

Gears should be used on many drives now equipped with belts. There is no doubt of the advantages of belts for long spans or the safety features of slipping in case of a jam; but it is impossible to predict at exactly what load a belt will slip, so if it is designed to have ample capacity under all loads, it is almost sure to have too much slip if conditions are good. A soft metal shearing pin used in connection with a gear drive gives the ideal combination for safety and positiveness.

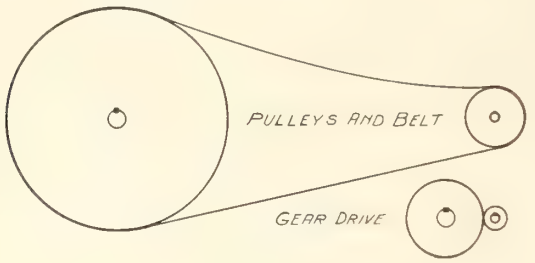


Fig. 7.

The diagram above shows the relative size of a gear and a belt drive of the same capacity. Also the gears would only be about one-third as wide as the pulleys. The saving in space is great. Gear drives are safer than belts because on account of their small size it is much easier to guard them effectively. The guards on a gear can frequently be made to form a complete enclosure containing an oil bath. This will promote the efficiency of the drive to such an extent as to be a paying investment of itself, so that the safety guard really costs nothing extra.

As a rule gears are more durable than belts, and, for the service they perform, are far cheaper in the long run. There is much less load on the bearings with gears, for belts only transmit power in proportion to the difference between the tensions on the tight and slack side. There is no fire risk with gears like that arising in dusty locations with belts, from static sparks or friction from rubbing against guards.

The saving of valuable space by the use of a compact gear drive is often of prime importance. Gears, especially rawhide pinions, or in large sizes the herringbone gear drives, lend themselves especially well to the individual electric motor drive in industrial plants.

Gears are more efficient than belts, due to the absence of slip and creep. Creep is always present in belts and slip usually so. With gears there is no slip, therefore no loss. The best way to get rid of your belting troubles is to replace the belts, wherever possible, with gears and plan to use gears on new drives.

Double-Helical Gears

The operating advantages, the smoothness, speed and strength, that may be obtained with this type of gear have definite mechanical reasons back of them. These are not as generally understood as they might be and the following is an explanation of some of the basic principles.

"Continuous Action" is the fundamental feature. The face of a correctly designed gear is wide enough so that the slant of the teeth allows each to overlop its neighbor by at least a small amount. That is, the

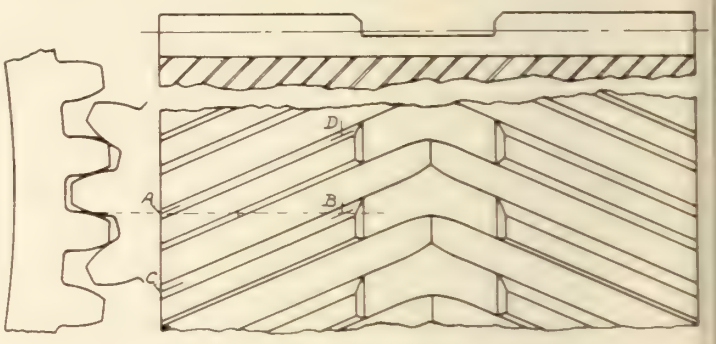


Fig. 8.

(half) working face is made greater than A B. Whatever condition of mesh exists at A is duplicated at B. C would be one pitch earlier and D one pitch later, and all along the faces of the teeth A D and C B, every point would represent a different condition from first engagement to recession. At any given instant the line of contact between a gear tooth and a pinion tooth would be a diagonal across the face of the tooth from near the root at one end to near the top at the other. This, of course, eliminates shocks and permits high speed with maximum strength and durability.

The two sections of the gear, right and left hand, are necessary to balance the thrust. It is immaterial whether the teeth are located opposite or staggered though the former is usual. There are carefully worked out standards for the angle, the minimum face and the groove width.

Note that there is no more sliding action with double helical gears than with spurs. The action is just as truly a rolling motion and not at all like a worm or spiral.

Mounting and Adjustment of Bevel Gears

Proper adjustment of bevel gears is a vital factor in obtaining quiet operation and durability. Backlash of about .012 inch per inch of circular pitch is desirable. The bearing surface under full load should be at about the pitch line and along the full length from heel to toe, but on account of spring in the shafts in the usual "over-hung" pinion mounting, it is necessary to show a toe contact when testing with a light load or on a testing stand, in order to get full bearing when loaded. The weaker the mounting, the shorter the contact should show, five-eights of the length of the face for average conditions, or nearly full length where the pinion is very rigidly supported. (Fig. 9).

First, set up with teeth flush at the large end, apply red lead and run. If correct, the marking will show

as in Fig. 1. If a cross-bearing shows (Fig. 2) there is an error in gear cutting or in the level of the shafts. Now adjust relative shaft heights. If there is a toe bearing over half the length on the driving side, they

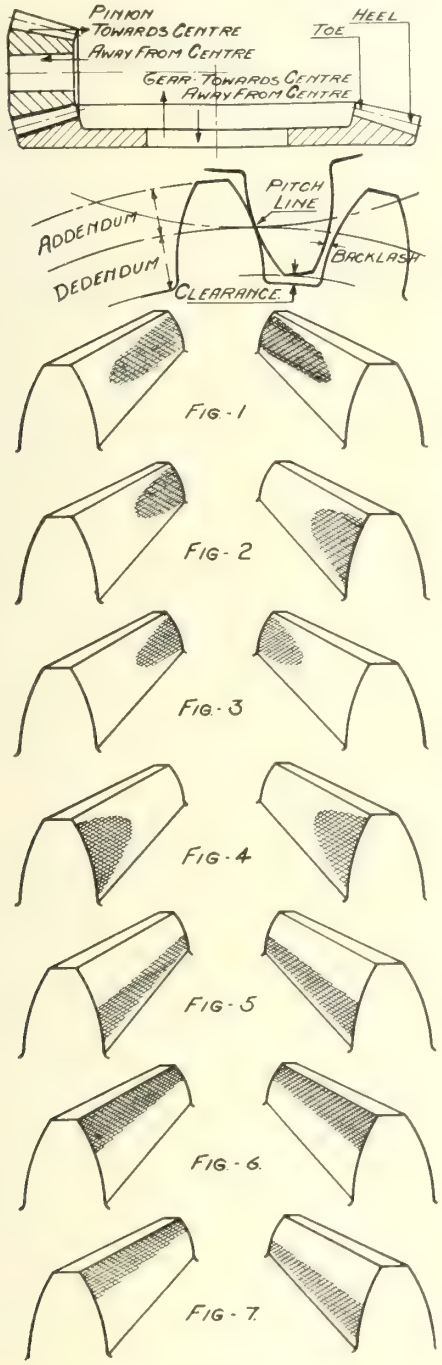


Fig. 9.

are usable, but not so with a heel bearing. If a toe bearing shows on both sides but is too short (Fig. 3) move the gear away from the pinion. If a heel bearing shows (Fig. 4), move the gear towards the pinion.

The position of the bearing up or down the tooth profile is adjusted independently. If the bearing is low (Fig. 5) move the pinion backwards from centre. If the bearing is high (Fig. 6) move the pinion towards centre. These movements will alter the lengthwise position of the bearing and several adjustments may be needed. A lame bearing (Fig. 7) shows errors or wear in the teeth. Such gears can be adjusted to give a fair bearing on the drive side but a bad reverse.

Spiral Gears

The consideration of direction of rotation of driver and driven in a pair of spiral gears, and the direction of their respective thrust pressures, are often very puzzling to one who is not continually handling such gears.

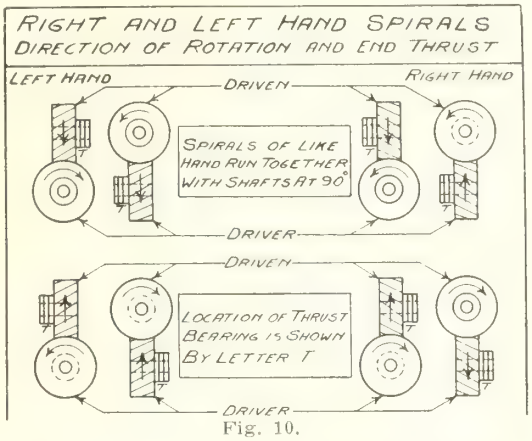


Fig. 10.

In this connection the above may be helpful. The arrows show plainly the direction of rotation, and the location of the thrust bearing is also indicated on the proper side of the gear. These thrust forces, acting in a direction parallel to the shaft, must be taken account of whether the driving or the driven shafts are parallel or at an angle.

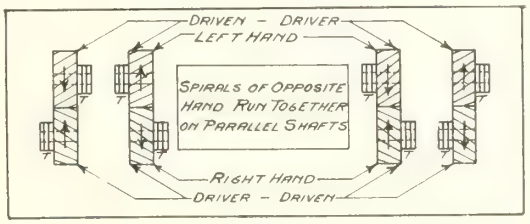


Fig. 11

Double helical gears, with shafts parallel (not shown), are composed of a right and a left hand helical section and thus balance their own thrust, so no external bearing is necessary. This is the very highest type of gearing and is recommended for all high-speed, heavy duty drives.

SUCTION GAS PLANT USES WOOD FUEL

It is well known that the most economical method of generating power from fuel is by use of the gas engine. The Lonely Mine, 43 miles from the railway at Buluwayo in Southern Rhodesia, has solved its power problems by this means. It had formerly a steam plant using 3,000 cords of wood a month. The present suction gas plant delivers the same power with a consumption of 600 cords a month. The plant is designed specially for the use of wood, and comprises four units of 350 h.p. each, with Crossley gas generators and Premier multi cylinder gas engines. Green timber can be used effectively in the gas producers.

ALCOHOL FROM CALCIUM CARBIDE

It has been suggested that alcohol can be manufactured cheaply from calcium carbide. Already acetic acid and acetone are made thus, and it is quite possible that further researches will show that alcohol also can be made in this way.

The use of petroleum as an illuminant dates from 1855, when an American professor first distilled it into fractions suitable for various uses.

THE MINING DISTRICTS

By THE JOURNAL'S CORRESPONDENTS

NORTHERN ONTARIO

Porcupine — There has been a temporary cessation of power in the Porcupine district on account of bush fires, but it only lasted about a day. The extended dry season resulted in a fire situation that was beginning to be quite dangerous, and that did result in burning out a short section of the transmission line. The fires were close to the town of Timmins when a change of wind and a moderate amount of rain removed the menace. The fire situation in the vicinity of the Rouyn district of Northwestern Quebec was also reported to be dangerous, but conditions are understood to have improved there as well.

The Dome is understood to have taken an option on the McIntyre claims in Gauthier township. This year the company has a very large and active exploration department and is putting scouts in practically all the active districts of Ontario, as well as having taken options on a large number of claims in the Rouyn district.

The West Dome Lake Consolidated has been unwatered to the 300-foot level, and this work will be continued to the 600-foot level. It is hoped that when that point is reached sufficient electric energy will be available to permit the shaft being continued to the 1,000-foot level.

McIntyre's production is understood to be running at the rate of approximately $300,000 a month, of which 50% should represent profit. If this rate can be maintained, there is every expectation that the dividend rate will be increased in the near future. The company's fiscal year ends June 30th, and it is possible that some definite action will be taken following the annual meeting. The present dividend rate is 15%. Mine development continues to be satisfactory, and there is a general feeling that McIntyre may prove eventually to be the most important mine in the district.

The Hollinger Consolidated is understood to be considering the installation of a Diesel oil engine of 1,200 h.p. in order to provide for the expected power shortage next winter, and to carry the company through the period of low power until the time when its own development on the Abitibi River will be ready. The bids for the construction of the 20,000 h.p. installation on the Abitibi River have all been filed, but so far no information regarding them has been given out. At the present time the company is generating 800 h.p. by steam and the mill is treating approximately 4,500 tons a day. According to the reports of the Northern Canada Power Company, the Dome, Hollinger and McIntyre are receiving the largest supply of electric energy in their history. Within a few days the Hollinger should be able to do without their steam power, as the Lower Sturgeon plant is now developing over 3,000 h.p. This will permit the Hollinger, in particular, to increase its mill output, and it is believed that within a comparatively short time the company will be treating about 6,000 tons a day. The regular four-weekly dividend of 1 per cent. has been declared, payable July 16th to shareholders of record June 28th.

Two shafts on the Ankerite property have been unwatered and the water is expected to be out of the main shaft within a short time. The property is now owned by the North American Gold Corporation, which has already put machines to work.

A meeting of the shareholders of the Porcupine-Davidson Gold Mines has been called for July 22nd to ratify by-laws proposing the sale of shares at a discount.

Kirkland — Production at the Teck-Hughes is running at the rate of approximately $100,000 a month, and there is good reason to believe that this rate of production can be maintained. Work on the 1,100-foot level is understood to be very satisfactory, and unofficial reports are to the effect that at that level the best ore of the mine has been opened up.

Col. Gear, president of the Crown Reserve, states that the result of drifting on the 550-foot level of No.1 vein at the Larder Lake property has been very satisfactory. Thirty feet of drifting shows values of $11.00 to $22.00 over a width of five feet. The vein, however, has a width of approximately twenty feet, and a crosscut is to be started to determine the values over the total width.

At the Northland property, fifteen men are engaged in surface exploration, and a number of veins have been found. A small portable boiler and a steam plugger drill are being used to assist in opening up the discoveries.

R. A. and I. M. Sinclair, contractors of Toronto, have secured the contract for the construction of the Kirkland Lake branch line to the Crown Reserve property. Construction is to be started immediately and steel is expected to be into the Crown Reserve by the end of the year.

A meeting of the shareholders of the Montreal-Ontario has been called for June 26th, to ratify the sale of 400,000 shares of treasury stock. This action is purely formal, as the stock was sold some time ago. No new reports are available regarding the discoveries recently made on the 450-foot level.

Kirkland. — During the month of May the Lake Shore mill treated 1,880 tons of ore, and recovered $53,649.70, an average grade of $28.43 a ton. This is understood to constitute a record month's production in the history of the company, but it is believed that it will be equalled in June.

Matheson — The Croesus Mine, near Matheson, which is owned by the Dominion Reduction Company, has been unwatered to the 100-foot level, and a small amount of mining is being done in an effort to locate further high-grade pockets similar to those found some years ago.

Ontario Mining Association — The annual meeting of the Ontario Mining Association is to be held in Kirkland Lake and South Lorrain on July 5th, 6th and 7th. The business meeting will be held in Kirkland Lake and an opportunity will be offered to visit the different mines of the camp on the 5th and 6th. On the afternoon of July 6th the party will return to Cobalt and on the 7th will go to South Lorrain by automobile.

Larder. — A special general meeting of the shareholders of the Argonaut Gold Mines has been called for July 7th. Delays have been experienced in starting the mill, but it is now expected that operations will commence early in July.

Cobalt. — The recent discovery of the Mining Corporation on the Peterson Lake property is lasting better than was originally anticipated. About fifty feet of drifting has been done, and the vein, while only one inch in thickness, carries values up to 3,000 ounces. It is expected that shipments to the mill will be started shortly.

Winzing operations on the 350-foot level of the Genessee have disclosed some promising ore. In places the vein shows an inch of high-grade ore, which will run 3,000 ounces to the ton. The ore-shoot has been opened up for a length of about forty feet.

La Rose has started sinking the Violet shaft from 635 feet to 685 feet. On the 635-foot level a strong vein has been found which shows, in places, 8 inches of 3,000-ounce ore. Regular shipments of mill ore are being made to the Mining Corporation mill and the grade is understood to be very satisfactory.

During the week ending June 22nd, the O'Brien shipped two cars of ore totalling 127,960 pounds, and the Coniagas shipped one car of flotation concentrate weighing 96,120 pounds.

Quinze Power Contracts — The Quinze Power Company, which is the new company formed by the Northern Canada Power Company to operate the Quinze power recently acquired from the Quebec Government, has been letting a large number of contracts and shows every indication of a determined effort to live up to the promise to have power in Porcupine in 1924. The company has sold its bonds to the Dominion Securities, Limited, of Toronto. It is estimated that the first unit of 20,000 h.p. will cost $3,000,000. Morrow & Beatty, who have built a majority of the large plants throughout Northern Ontario, have secured the contract for the construction work. The generators, electric switching apparatus and transformers will be supplied by the Swedish Electric Company, of Sweden. The Northern Aluminum Company will supply 720 miles of aluminum wire for the transmission line. The Canada Bridge Company has the contract for 972 steel transmisssion towers. The first of these will be delivered in less than two months. The Canadian Porcelain Company of Hamilton has the contract for all transmission line hardware, and the Dominion Engineering Company of Montreal has the contract for the water wheels.

Power Supply — The recent rains have somewhat improved the power conditions in the Porcupine district. It is now reported that the Sturgeon Falls development should be supplying power by July 1st.

Ontario Department of Mines Loses C. W. Knight — Mr. C. W. Knight, Assistant Provincial Geologist for Ontario, is leaving the Government service to accept a position with the Nipissing Mining Company. He has been with the Department for the last nineteen years and is more particularly known for his work in the Sudbury and Cobalt districts. The Department of Mines and the mining industry can ill afford to lose the public services of a man of Mr. Knight's experience and attainments, and of one who has been so closely identified with the development of Northern Ontario. It can hardly be considered a tribute to the head of the Department of Mines that Mr. Knight's position in the Government service should not have been made sufficiently attractive to retain his services. It is well known that the technical men of the department are inadequately paid, and this is a policy with which the mining men of the province have no sympathy. The industry is of sufficient importance and the revenue derived from it is ample to justify decent salries, commensurate to the work that is being done. It is to be hoped that Mr. Knight's resignation may have a salutary effect and that although the Province loses his services, it may react to the benefit of the other members of the staff of the department.

The Provincial Elections. — The recent Ontario elections resulted in a landslide that has seldom been equalled in the political history of the Province. As a result, Hon. Howard Ferguson will be the next Premier and Mr. Chas. McCrea, of Sudbury, will be the next Minister of Mines. This is of particular interest to the mining industry of Northern Ontario, because Mr. Ferguson is generally credited with being the best Minister of Mines that the Province has ever had, and he thoroughly understands the needs of Northern Ontario. Mr. McCrea, who is a lawyer, has lived most of his life in the mining district of Sudbury, and is believed to be a worthy successor of Mr. Ferguson. His appointment will meet with the general approval of the mining men throughout the Province, and it is now felt that this important industry will receive the consideration it deserves, which it has not received during the past several years.

NORTHWESTERN QUEBEC

Interest has been aroused by reports of new finds in Boischatel township and in Duprat township.

Preparations are being made by Mr. Fletcher, in charge, for drilling the Noranda ground in Rouyn. Messrs. Thomson and Chadbourne are on the property, and twenty-three men are employed.

Mr. Charlie Richardson has made another trip to his Rouyn ground, but has not done much work as yet.

William Gowan, for the La Rose; Patrick Meehan, for the Lyman interest; Major Dunlap and James Bartlett for the Coniagas, have small crews in the Pelletier lake section of Rouyn.

It costs $21 to bring a man from Ville Marie into Rouyn; so the expense of prospecting some of the Quebec areas is something pioneers have to contend with.

The recent fires, which advanced on a 25-mile front, burned through Boischatel, starting at the west end of that township, and went within two miles of the Noranda. Many claims were completely burned over. The heavy rains have given more prospectors a chance to enter the bush.

Confusion in the staking of certain claims north of Pelletier lake has enabled men said to represent the Nipissing company to re-stake them.

Dr. Thompson has opened an office on Osisko lake and is prepared to care for men at the respective prospects on a basis of $1 per month per man. He was formerly connected with Dr. Arnold of Haileybury.

The transportation system between Ville Marie and Pelletier lake is intolerably poor. The service is irregular. It is a common thing to have to wait for days at Sturgeon Point, German Point, or Gillies Depot, for a boat. One engineer who paddled out 16 miles to German Point, rather than wait for a boat there paddled another 45 miles to Sturgeon Rapids, found a boat there, and then had to wait at Gillies; so he chose to hire an auto from a farmer, at a cost of $12, in order to reach Ville Marie. Such facilities for transport are not calculated to hasten work.

There is no telephone communication between Gillies and Ville Marie. There is a Government telephone line, but it is out of order, and has been so for three weeks or more.

With a regular schedule the trip from Ville Marie to Pelletier or Rouyn could be made in a day, instead of three or four days, as sometimes happens.

The fire made a ready-made roast moose for a party at Lake Fortune. It also wiped out the ice house, where the moose reposed.

The Noranda has several pits sunk on their ore bodies and wish to know more of their Powell vein at depth; hence the present use of the diamond drill.

Though transportation conditions are somewhat inadequate and annoying, and the black flies have been insufferable, and the cost of taking labor in to the fields is excessive, it is the greater tribute to the enterprise of those with working forces that they are making progress.

NOVA SCOTIA

The U. M. W. A. Convention. — Some time ago the *Canadian Mining Journal* made the statement that everything would run smoothly at Nova Scotia collieries, should there be no election of U. M. W. officers until December. It was foreseen that an election might take place during the summer months, and as District No. 26 has become more of a political than a labor organization, election issues would be sure to bring about considerable trouble. The election has come, and with it a threat of strike, if the 1921 rates are not paid. This demand was made from a convention held in New Glasgow, when a telegram was forwarded to President Wolvin demanding the payment of these rates. The reply was in the negative, and went on to state that "the Company were satisfied with the present rates, that they had made their contracts under them, and any increase in wages would result in large financial loss to the company."

It ought to be noted that the 1921 rates are the war-peak wage rates, when the cost of living was high. With the present much reduced cost of living, it is hard to understand why these rates should be so strongly urged. During the war the United Mines Workers, when approaching the Dominion Coal Company for any increase in wages, used the increased cost of living as one of their strongest arguments. It was a very plausible argument, and also very successful. But just as soon as the cost of living began to fall and the company began to reduce wages, the question was asked by the United Mine Workers, "What has the cost of living to do with wages?" It has much to do with it, every way. There might be some justification in asking for the 1921 wage rates if the cost of living had remained the same as in 1921. But there can be no reasonable argument in favor of 1921 wages when the cost of living is much below what it was that year. There are two ways of increasing wages; one is to give a straight increase, while the other is to reduce the cost of living. This latter has been done and the present wage rate at the present cost of living is equal to, if not larger than, the 1921 rate. If the United Mine Workers succeed in their present attempt to increase wages, the purchasing power of their earnings will be far beyond that of any other time in the history of mining in Nova Scotia. While they may be only receiving the 1921 rate, yet the increase gained will be equivalent to the difference in the cost of living between 1921 and the present time, which is about 48 per cent.

President Lewis Takes a Hand.—There is another side to this question, of far more importance than the financial side, serious as that is. It is the moral side. That the Executive of any labor organization should enter into any wage agreement to last for a certain period and then openly advocate its violation when only half completed, shows a state of moral degeneration that can be viewed only with alarm. These men seem to be determined to demoralize the miners of Nova Scotia, and up to the present, they have been fairly successful in their aims. But now it seems that they have reached the length of their tether, and that President Lewis is endeavoring successfully to curb them. Finding that the District Convention was determined to have a strike, President Lewis wired them as follows:

"Indianapolis, June 22nd, 1923.

"Dan Livingstone, President, District 26, United Mine Workers of America, New Glasgow.

"International Executive Board has considered your telegram of June 21st stating convention of District 26 considers agreement with coal operators as being now null and void.

"This action is an unwarranted violation of the traditions and consistent policies of the United Mine Workers, which believes in the integrity of contracts and strict adherence to its provisions by all parties thereto. No district of the United Mine Workers has ever repudiated a joint agreement after it had been accepted by the membership affected and the International Executive Board cannot permit District 26 to take ill-considered action by their violating every rule of honorable joint relationship and bring our Union into disrepute.

"The agreement in District 26 was made for a specific period and was ratified by membership of that district by referendum vote. International Executive Board will insist that this contract be continued in force and effect until the specific date of termination.

"It is also true that Article 16, Section 1 of International Constitution prevents your district from engaging in a strike involving all or a majority of its membership without the sanction of the International Union. The International Board does not propose to tolerate any violation of this Section.

"Your statement is in error, when you state your most unwarranted procedure to be in harmony with the policy of the International Union. Your policy is also in error when you undertake to base such action upon statement made in Executive Session by one of the membership of International Commission which recently visited that district.

"This telegram has been sent with approval of International Executive Board and I would like to have official assurances that there will be no violation of the laws and the policy of the United Mine Workers in this respect by District No. 26.

"(Signed) JOHN L. LEWIS."

If District No. 26 persists in taking a strike vote and if it succeeds in causing a strike it is plainly to be seen that its charter will be withdrawn.

While the Convention in New Glasgow was in progress, President Lewis wired instructions that all connection be cut between the Red International and District 26. The District replied that "this had been done; but they reserved the right to do their own thinking." At the same time an extremist labor leader from Sydney was in the Convention and advised the members to "bore from within". This is the communist policy, and who among this element cares what the means are provided the aim is accomplished? It is reasons of the

kind that caused President Lewis to send a commission into the district, and these men have not been slow to interpret the trend of Union affairs in Nova Scotia.

The Steel Strike. — The Sydney public, weary of the long drawn-out labour agitation that has again broken out in violent eruption to the undoing of business, is not sorry that the time has arrived to settle accounts. The long threatened strike began at 3 a.m., on June 28th, when the blast-furnace men and others walked off the plant, but failed to make it one hundred per cent effective. One-third of the men did not respond to the strike call, and it is well known that the majority of the men out on strike are not in sympathy with it. While the labor leaders no doubt intended to have "peaceful picketing," the number of men remaining at work inflamed the more volatile element and considerable rioting took place on the first night. Raid after raid was made on the main plant to intimidate the maintenance men; but these failed, the only men leaving being those who were forcibly carried out. No less than six raids were made on the coke ovens, with the intention of closing them down. It is just such mob action that defeat the aims of the strikers, and destroys whatever sympathy is left for their cause. Whether the strike be long or short, it is quite certain that Sydney Steel Plant, when fully operated again, will have saner workmen, that business will be established on a surer foundation, and that there will be more room for a fraternal feeling among the workmen themselves, and also a better understanding between the officials and the workers.

There is little doubt about the result of the strike. It is the day of reckoning that could not be averted, and must be endured until the test is complete and the cost counted. The workmen of the steel and coal industries of Nova Scotia cannot go on as they have been going, the battle is on, and must be fought to a finish. Labor has long ago discarded conciliation as a worn-out method of settling disputes, and has gone back to the barbarous weapons of warfare. That they will perish by these weapons, is the common opinion of all interested in the strike now going on.

BRITISH COLUMBIA

Kitchener — The Leadville Group of silver-lead claims, near Kitchener, eastern B. C., is under development by Spokane capitalists. A small crew is employed on the property and a road is being constructed to furnish transportation facilities.

Promising Gold Prospect — The Silver Bar Mining & Development Co. Ltd., with holdings near Ewing's Landing on Okanagan Lake, is reported to have uncovered promising showings. There is an ore-body of 36 feet in width which, it is said, have given returns of from $55 to $270 in gold to the ton. A. W. Davis, the Government mining engineer, in his annual report stated that the property was of peculiar interest because of its surface showings. As to mining conditions, two-mile aerial tramway connect the prospect with a dock on the lakside. Timber is plentiful, but water scarce.

Railway Proposed in Portland Canal District — The construction of a railroad from tidewater at Hyder, Alaska, through the Salmon River Valley to the boundary of British Columbia, a distance of thirteen miles, again is being discussed. Chas. F. Caldwell, mining operator, first proposed this work four years ago and organized the Portland Canal Short Line Ry. Nothing was done because the project was considered premature. Now, however, conditions are different. A considerable tonnage of ore, independent of that of the Premier Gold Mining Co., which is handled over its aerial tramway, is promised, in fact, it seems assured. The railway, which is said to offer no unusual or insuperable engineering difficulties, is believed to be a practical enterprise and, from the viewpoint of the mining industry of the district, a necessity. Mr. Caldwell is in London endeavoring to raise funds for the carrying out of the work. A charter was obtained for the railroad some time ago.

A Reprieve for Barkerville — John Hopp, who controls extensive placer holdings in the Cariboo district, will not proceed with the hydraulicking of the ground on which the historic town of Barkerville stands, during this summer. This had been his intention, but a change of plans assures the ancient community at least another year of life undisturbed.

Trail Ore Receipts — A total of 10,870 tons of ore were received at the Trail Smelter, Consolidated Mining & Smelting Co. of Canada, during the week June 8 to 14, the detailed shipments being as follows:

Mine	Tonnage
Alamo, Alamo	94
Bell, Beaverdell	43
Bosun, Silverton	102
Company Mines	9826
Emerald, Salmo	33
Knob Hill, Republic Wn.	54
Lone Pine, Republic Wn.	330
Park Gp., Maryville	30
Providence, Greenwood	4
Quilp, Republic Wn.	103
Salmo Ore., Salmo	41
Silversmith, Sandon	87
Standard, Silverton	156
	10,870

B. R. Mackay in Cariboo — Dr. B. R. Mackay, of Cornwall, Ont., formerly with the Canadian Geological Survey, who accepted a commission in 1920 from Lord Cowdray to make a geological survey of sections in India with particular reference to oil producing possibilities, returned to Canada recently by way of China. Before leaving America Dr. Mackay was engaged in the geological survey of the Cariboo District of British Columbia and he is returning to that field to investigate, on behalf of private interests, the economic possibilities of certain placer gold areas.

Practically the whole of India, Dr. Mackay states, has been covered in late years by geologists and their working parties. He directed operations on the northwest frontier and located some promising structures. He was in the northwest Punjab, in Cashmir, and in Burmah. As a result of his researches one well has been sunk 1,000 feet in the Punjab and something like $1,000,000 is available for the proving of this ground. While there were good formations in the northwest frontier, speaking generally, Dr. Mackay was not optimistic as to the prospects of early development. Conditions were too unsettled. White men were practically unknown in this field and while there he was accompanied by an armed escort and the camps were frequently raided. One of his parties lost two men through such forays. Notwithstanding this handicap, satisfactory progress was made. He, and parties under his direction made geological maps of 3,500 square miles of the northwest frontier, 8,000 square miles of the Punjab, and 5,000 square miles of Burmah.

In Burmah, the chief oil producer of the British Empire, all the producing wells are on one area three quarters of a mile square. On this tract there are 4,000 wells and the derrick structures give the region the appearance of a dense forest. His work was in other parts of Burmah and highly favorable indications were found.

The race for oil, he said, still is a tremendous international competition. In India only British companies could operate, so that Lord Cowdray did not hesitate to invest largely in the development of the field. Upon the results of the test well being sunk in the Punjab depends largely the extent of future development there.

More Ore at Cork-Province — The Cork-Province Mine, Kaslo Creek, is reported to have broken into an important ore-body on the new 400-ft. level. The width is undefined, but on the 300-ft. level the same vein proved to be 300 feet long and from 4 to 30 feet wide. The ore just uncovered is said to be of good milling grade.

Ore Shipments from Mayo — Seventeen carloads of highgrade silver ore from the Mayo Camp, Yukon Territory, are reported at Nena, 215 miles north of Anchorage, Alaska, and at the junction of the Alaska Railroad and the Tanana River. It is valued at $280,000 and was brought by steamer down the Yukon through Dawson and up the Tanana River to Nena. There it is to be loaded on railway cars and shipped to Anchorage whence it will be taken by steamer to refineries in the United States.

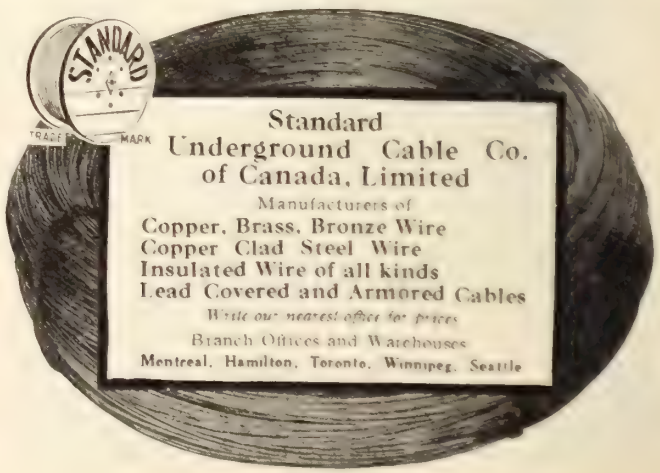
Minister Inspects Mines — Hon. Wm. Sloan, Minister of Mines for British Columbia, has been engaged in making a tour of the underground workings of the coal mines of Vancouver Island. He has been accompanied by the new Chief Inspector of Mines, George Wilkinson. They visited No. 1 and the Reserve, Western Fuel Corporation of Canada, and the Extension, South Wellington, and Nanoose Wellington properties. Next week the intention is to take in the workings of the Cumberland Collieries, Canadian Collieries (D) Ltd. Later on the Nicola-Princeton and Crow's Nest Pass fields will be inspected.

Sulphurous Gases to be Investigated — In making the round of the island coal mines the Hon. Mr. Sloan found conditions as to gas, and in other respects as to the safety of the miners, very satisfactory. Some of the workings places in No. 5 Mine, South Wellington, and the Reserve Mine, near Nanaimo, still are a source of trouble to the miners because of the sulphurous fumes given off by the coal. To this condition the minister paid special attention and he has decided to call in the aid of an eminent bacteriologist and pathologist in order to determine whether something cannot be done to eliminate, or at least alleviate, the trouble. Dr. R. H. Mullin, a recognized authority on health work and industrial hygiene, and head of the Bacteriological and Pathological Department of the University of British Columbia, is to be asked to make this investigation and to submit a report with recommendations as soon as possible.

ALBERTA

Conference on Coal in Winnipeg — It has been announced that Sir Henry Thornton, president of the Canadian National Ry., will attend the conferences to be held at Winnipeg, Manitoba, regardinig freight rates on Alberta coal to Eastern Canadian points. The Canadian Pacific Ry. Co. also will be represented on this occasion and there will be present as well representatives of the Ontario and Alberta Governments, the coal dealers of Ontario and the operators of Alberta. The meeting is expected to take place in the course of a few. weeks. The object is to obtain a rate on Alberta coal that will permit it to be shipped into Ontario and sold at a price that will assure successful competition with imported coals. G. R. Pratt, in charge of the Alberta demonstration office at Winnipeg, states: "We cannot do anything with the $9 rate offered by Sir Henry Thornton and a lower rate is imperative if Alberta coal is to be given a fair chance of competing in the east against American coal. In Toronto hard coal is now being sold at $15.50 a ton. That is a substantial reduction from the prices last winter when it was selling from $18.20 up to $20.50 in Toronto. The prices have come down since we started our eastern campaign."

New Strip Mine to be Opened — An important coal property situated on the south shore of Wabamun Lake, northern Alberta, is being developed by the British Canadian Collieries Ltd. The leased rights obtained from the Canadian Government and the C.P.R. include some 2,200 acres. The coal seam shows on the lake front for the length of a mile and its existence has been known for some time. Development has been retarded because it is on the opposite side of the lake from the railway, making the transportation problem serious. The company has secured a charter for a branch railway eight miles long which will leave the Grand Trunk Pacific three miles west of the town of Duffield and, running southwesterly, will cross the narrows of Goose Quill Bay to reach the mining property. The railway has been surveyed and construction will commence about July 1st next. The coal measures have been thoroughly tested by drill and a seam has been demonstrated 24 feet in thickness throughout. It is estimated that there is 30,000 tons of first class coal to the acre. On 1,200 acres the coal carries an over burden of from 20 to 28 feet. The average depth is 30 feet. It is the intention to strip this, the overburden being removed with a large Bucyrus steam shovel having an 85-foot beam. A smaller shovel will be used to load the coal. First-class screening facilities are to be installed. The heavier machinery will be taken in over the railway as soon as the steel is laid, and it is confidently expected that the industry will be on a producing basis before next winter. Electric power is being provided for all operations.



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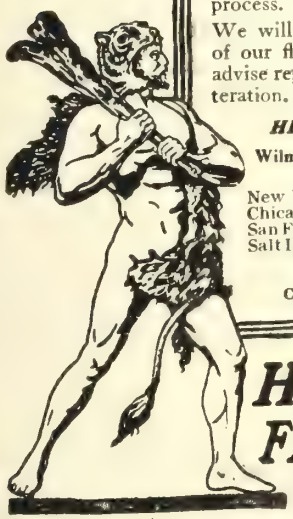

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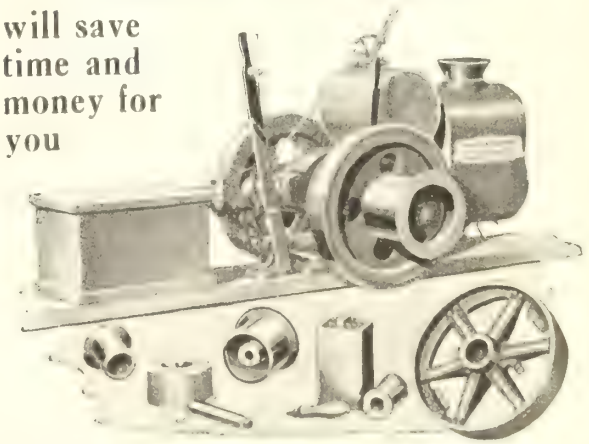

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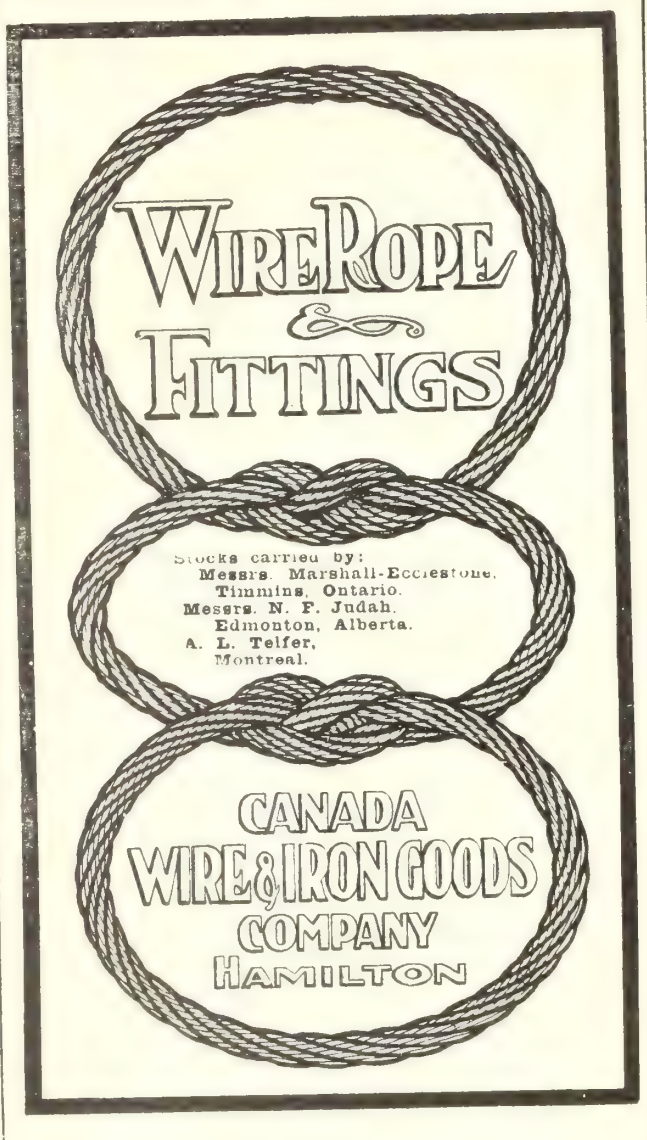

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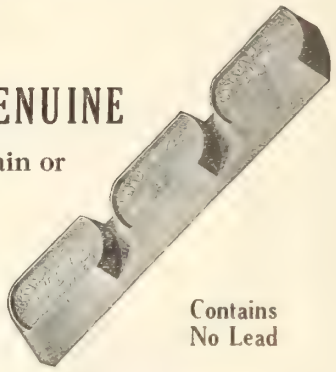

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Holman Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
Peacock Brothers, Limited.
The William Kennedy & Sons, Ltd.

Ball Mills:
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
Mine & Smelter Supply.

Ball Mill Feeders:
Herbert, Alfred, Limited.
Holman Bros. Ltd.
Hull Iron & Smelter Supply.
Mine & Smelter Supply.

Ball Mill Linings:
Canadian Steel Foundries, Ltd.
The William Kennedy & Sons, Ltd.
Peacock Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
Mine & Smelter Supply

Belting — Leather, Rubber & Cotton:
Canadian Link-Belt Co., Ltd.
Jones & Glassco (Reg'd)

Belting:
Gutta Percha & Rubber, Ltd.

Belting (Conveyor):
Canadian Fairbanks-Morse Co., Ltd.
Gutta Percha & Rubber Ltd.
Dunlop Tire & Rubber Co., Ltd.

Belting — Silent Chain:
Canadian Link-Belt Co., Ltd.
Hans Renold of Canada, Ltd.
Jones & Glassco (Reg'd)

Bins & Hoppers:
Can. Chicago Bridge & Iron Co., Ltd.
Horton Steel Works, Ltd.
The William Kennedy & Sons, Ltd.

Bluestone:
The Consolidated Mining & Smelting Co.

Boilers:
The William Kennedy & Sons, Ltd.

Boxes, Cable Junction:
Standard Underground Cable Co. of Canada, Ltd.
Northern Electric Co., Ltd.

Brazilian Ballas:
Diamond Drill Carbon Co.

Brick:
Westlander Bros.

Bronze, Manganese, Perforated & Plain:
Hendrick Manufacturing Co.

Buckets:
Canadian Ingersoll-Rand Co., Ltd.
Canadian Link-Belt Co., Ltd.
Canadian Fairbanks-Morse Co., Ltd.
Hadfields, Limited
Hendrick Manufacturing Co.
Herbert, Alfred, Limited
Holman Bros., Ltd.
The William Kennedy & Sons, Ltd.
Peacock Bros., Ltd.

Bucket Lips:
Canadian Steel Foundries, Ltd.
The William Kennedy & Sons, Ltd.

Buggies, Mine Car (Steel):
Hendrick Manufacturing Co.
Herbert, Alfred, Limited
Holman Bros., Ltd.

Cable — Aerial and Underground:
Canada Wire & Cable Co.
Standard Underground Cable Co. of Canada, Ltd
Peacock Brothers, Limited

Cables — Wire:
Standard Underground Cable Co. Ltd.
Canada Wire & Cable Co.
Peacock Bros. Ltd.
Cable Railway Systems:
Canada Wire & Cable Co.

Cages:
Canadian Ingersoll-Rand Co. Ltd.
The Mine & Smelter Supply Co.
Herbert, Alfred, Limited.
Holman, Ltd.
The William Kennedy & Sons, Ltd.

Cam Shafts:
Canada Foundries & Forgings, Ltd.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
Peacock Brothers, Ltd.

Cars:
Canadian Mead-Morrison Co.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
John J. Gartshore.
Peacock Brothers, Limited.
The William Kennedy & Sons, Ltd.

Car Dump:
Canadian Mead-Morrison Co.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Sullivan Machinery Co.

Cars—Hand:
Sylvester Mfg. Co., Ltd.

Cars—Mine:
William Kennedy & Sons Ltd.

Car Pullers:
Canadian Mead-Morrison Co.

Carries (Gravity):
Jones & Glassco, Reg.

Car Wheels and Axles:
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
John J. Garthshore.
Peacock Brothers, Limited.
The William Kennedy & Sons, Ltd.

Cast Steel Gears:
Canada Foundries, Ltd.
The William Kennedy & Sons, Ltd.

Castings (Iron and Steel):
Herbert, Alfred, Limited.
Holman, Bros., Ltd.
Peacock Brothers, Limited.
The William Kennedy & Sons, Ltd.

Cement Machinery:
Hadfields, Limited.
Hull Iron & Steel Foundries, Ltd
The William Kennedy & Sons, Ltd.

Chains:
Jones & Glassco, Reg.
Canadian Link-Belt Co., Ltd.
Greening, B. Wire Co., Ltd.

Chain Drives:
Jones & Glassco (Regd).

Chain Drives — Silent & Steel Roller:
Canadian Link-Belt Co. Ltd.
Hans Renold of Can., Ltd.
Jones & Glassco (Regd.).

Chemist:
Thos. Heyes & Sons.
Milton Hersey Co.
Ledoux & Co.

Chrome Ore:
Everitt & Co.

Classifiers:
The Dorr Company.

Clutches:
Canadian Link-Belt Co., Ltd.
Hans Renold of Can., Ltd.

Coal:
Dominion Coal Co.
Nova Scotia Steel & Coal Co.

Coal Cutters — Coal Pick Machines:
Sullivan Machinery Co.
Canadian Ingersoll-Rand Co., Ltd.
Hebert, Alfred, Limited.
Holman Bros., Ltd.
Peacock Brothers, Limited.

Coal Crushers & Conveyors:
Canadian Link-Belt Co., Ltd.
Peacock Brothers, Limited.

Coal Mining Machinery:
Canadian Ingersoll-Rand Co., Ltd.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co. Ltd.
Sullivan Machinery Co.
Hadfields, Limited.
Hendrick Mfg. Co.
Hebert, Alfred, Limited.
Holman Bros. Ltd.

Coal Screening Plants:
Canadian Link-Belt Co., Ltd.
Canadian Mead-Morrison Co.

Cobalt Oxide:
Everitt & Co.

Compressers — Air:
Bellis & Morcom, Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Denver Rock Drill Mfg. Co.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Laurie & Lamb.
Smart-Turner Machine Co.
Peacock Brothers, Limited.

Concentrating Tables:
Herbert, Alfred, Limited.
Holman Bros., Ltd.
The Mine & Smelter Supply Co.

Concrete Mixers:
Gould, Shapely & Muir Co., Ltd.

Condensers:
Canadian Ingersoll-Rand Co. Ltd.
Smart-Turner Machine Co.
Belliss & Morcom, Ltd.
Laurie & Lamb.
Peacock Brothers, Ltd.

Condensers — Electrical Static & Power:
Griswold & Co.

Consulters and Engineers:
Milton Hersey Co., Ltd.

Conveyors:
Canadian Link-Belt Co., Ltd.
Canadian Mead-Morrison Co.
Jones & Glassco (Regd.).

Conveyor Belts:
Gutta Percha and Rubber, Ltd

Conveyor Flights:
Canadian Link-Belt Co., Ltd.

Conveyor — Trough — Belt:
Canadian Link-Belt Co., Ltd.
Hendrick Mfg. Co.
Jones & Glassco, Regd.

Copper:—
Consolidated Mining & Smelting Co.

Couplings:
Hans Renold of Can., Ltd.

Cranes:
Canadian Link-Belt Co., Ltd.
Canadian Mead-Morrison Co.
Peacock Brothers, Limited.
Smart-Turner Machine Co.

Crane Ropes:
Allan Whyte & Co.
Canada Wire & Cable Co.
Greening B., Wire Co., Ltd.

Crucibles:
The Mine & Smelter Supply Co.

Crusher Balls:
Canada Foundries & Forgings, Ltd.
Herbert, Alfred, Limited.
Holman, Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
Peacock Brothers, Limited.
The William Kennedy & Sons, Ltd.

Crusher Jaws:
Canadian Steel Foundries, Ltd
The William Kennedy & Sons, Ltd.

Crushing Rolls:
Canadian Steel Foundries, Ltd.
The William Kennedy & Sons, Ltd.

Crushers — Jaw & Gyratory:
Canadian Ingersoll-Rand Co., Ltd.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
Wettlaufer Bros.
Lymans, Limited.
The Mine & Smelter Supply Co.
Hadfields, Limited.

Cut Gears:
Hans Renold of Can., Ltd.
Jones & Glassco, Regd
The William Kennedy & Sons, Ltd.

Cyanide:
Cyanide Plant Equipment:
The Dorr Co.
The Mine & Smelter Supply Co.

Derricks:
Smart-Turner Machine Co.

Diamond Drill Contractors:
Smith & Travers
Sullivan Machinery Co.

Digesters:
Can. Chicago Bridge & Iron Co., Ltd.
Horton Steel Works, Ltd.

Diesel Engines:
Belliss & Morcom, Ltd.
Laurie & Lamb.

Dies:
Canada Foundries & Forgings, Ltd.
Herbert, Alfred, Limited.
Hull Iron & Steel Foundries, Ltd.
Holman Bros., Ltd.
Dredging Ropes:
Allan Whyte & Co.
Greening, B. Wire Co., Ltd.

Drain Tile:
Wettlaufer Brothers.

Dredges:
Canadian Mead-Morrison Co.

Dredger Pins:
Hull Iron & Steel Foundries, Ltd.

Dredging Machinery:
Hadfields, Limited.
Hull Iron & Steel Foundries, Ltd.

Drills — Air and Hammer:
Canadian Ingersoll-Rand Co., Ltd.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Herbert, Alfred, Ltd.
Holman Bros., Ltd.
Sullivan Machinery Co.
The Mine & Smelter Supply Co.

Drills — Core:
Canadian Ingersoll-Rand Co., Ltd.
Herbert, Alfred, Limited
Holman Bros., Ltd.
Sullivan Machineery Co.

Drill Steel Furnaces:
Canadian Ingersoll-Rand Co., Ltd.
Denver Rock Drill Mfg. Co.
Herbert, Alfred, Limited
Holman Bros., Ltd.
Sullivan Machinery Co.

Drills — Diamond:
Sullivan Machinery Co.

Drill Steel — Mining:
Canadian Ingersoll-Rand Co., Ltd.,
Hadfields, Limited
Mussens, Limited

Drill Steel Sharpeners:
Canadian Ingersoll-Rand Co., Ltd.

Drills — Electric:
Herbert, Alfred, Limited
Holman Bros. Ltd.
Sullivan Machinery Co.
Northern Electric Co., Ltd.

Drills — High Speed and Carbon:
Hadfields, Limited
Herbert, Alfred, Limited
Holman Bros, Ltd.

Ejectors:
Canadian Ingersoll-Rand Co., Ltd.

Electric Condensers:
Griswold & Co.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Herbert, Alfred, Limited
Holman Bros., Limited
Northern Canada Supply Co.

Electric Hoists:
Canadian Mead-Morrison Co.

Elevators:
Canadian Machinery Co.
Sullivan Machinery Co.
Canadian Link-Belt Co., Ltd.
Northern Canada Supply Co.
Hadfields, Limited.
Jones & Glassco (Regd.).

Engineering & Surveying Instruments:
Laurie & Lamb.
C. L. Berger & Sons.

Engines — Ventilating:
Canadian Sirocco Co., Ltd.

Engines, Diesel:
Bellis & Morcom Ltd.
Laurie & Lamb.

Engines — Gas and Gasoline:
Belliss & Morcom, Ltd.
Sullivan Machinery Co.
Gould, Shapely & Muir Co., Ltd.
Laurie & Lamb.
The Mine & Smelter Supply Co.

Engines — Haulage:
Canadian Ingersoll-Rand Co., Ltd.

Engines — Steam:
Canadian Ingersoll-Rand Co., Ltd.
Laurie & Lamb.

Engineers:
Dresser, John A.
Dorr Co.
Ferrier, W. F.
Hore, R. E.
Heves & Sons, Thos.
Hersey Co. Ltd., Milton
McEvoy, James C.
Rogers, George R.
Ross, Jas. G.
Stewart, Robert H.
Tyrell, J. B.
Whitman, Alfred B.
Wilson, Ridgeway R.

Exhauster:
Canadian Sirocco, Ltd.

Ferro-Alloys (all Classes):
Canadian Steel Foundries, Ltd
Everitt & Co.

Fire Fighting Supplies:
Gutta Percha & Rubber, Ltd.

Flood Lamps:
Northern Electric Co., Ltd.

Flotation Oil:
Hercules Powder Co.

Fluorspar:
Consolidated Mining & Smelting Co.
Everitt & Co.

Forging:
Canada Foundry & Forging, Ltd.
Herbert, Alfred, Limited
Holman Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
Smart-Turner Machine Co.

Frogs: — See Switches & Turntables
Canadian Steel Foundries, Ltd.
Hull Iron & Steel Foundries.
John J. Gartshore.

Furnaces — Assay:
Lymans, Limited.
Mine & Smelter Supply Co.

Gasoline Extraction Compressors:
Canadian Ingersoll-Rand Co., Ltd.
Sullivan Machinery Co.

Gasoline Tanks — See Tanks:
Can. Chicago Bridge & Iron Co., Ltd
Horton Steel Works, Ltd.

Gaskets:
Gutta Percha & Rubber, Ltd.

Gears:
Hans Renold of Canada, Ltd.
Jones & Glassco, Regd.
The William Kennedy & Sons, Ltd.

Gears (Cast):
Canadian Link-Belt Co., Ltd.
The William Kennedy & Sons, Ltd.
Hull Iron & Steel Foundries, Ltd.

Gears: Machine Cut:
The Hamilton Gear & Machine Co.
The William Kennedy & Sons, Ltd.

Gold Refiners:
Goldsmith Bros.

Gold Pans:
Can. Chi. Bridge & Iron Works, Ltd.
Horton Steel Works, Ltd.

Grab-Buckets:
Canadian Mead-Morrison Co.

Hose:
Goodyear Tire & Rubber Co.
Gutta Percha & Rubber, Ltd.
Dunlop Tire & Rubber Co.

Hangers and Cables:
Stan. Underground Cable Co., Ltd.

Heating Systems:
Canadian Sirocco Co., Ltd.

High Speed Steel:
Hadfields, Ltd.

Hoists — Air, Electric and Steam:
Canadian Ingersoll-Rand Co., Ltd.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Herbert, Alfred, Ltd.
Holman Bros., Ltd.
Jones & Glassco, Regd.
Mine & Smelter Supply Co.
Canadian Link-Belt Co., Ltd.
Peacock Bros., Ltd.
Sullivan Machinery Co.

Hoisting Towers:
Canadian Mead-Morrison Co.

Hydraulic Machinery:
Hadfields, Ltd.
Belliss & Morcom, Ltd.
Laurie & Lamb.
The William Kennedy & Sons, Ltd.

Industrial Chemists & Inspectors:
Hersey, M. & Co., Ltd.

Insulating Compounds:
Standard Underground Cable Co.

Jacks:
Northern Canada Supply Co.
Jaw & Gyratory Crushers, See Crushers:

Lamp-Miners:
Northern Electric Co.
Peacock Bros., Ltd.

Lead (Pig):
Consolidated Mining & Smelting Co.

Link Belt — See Chain Drives:
Locomotives (Steam Compressed Air and Storage):
Canadian Ingersoll-Rand Co., Ltd.
Laurie & Lamb.

Machine Guards:
Greening, B. Wire Co., Ltd.

Magnesium Metal:
Everitt & Co.
Hull Iron & Steel Foundries, Ltd.

Manganese Steel, See Steel, Manganese:
Canadian Steel Foundries, Ltd
Hadfields, Ltd.

Metal Merchants:
Consolidated Mining & Smelting Co.
C. L. Constant Co.
Everitt & Co.

Metallurgical Engineers:
The Dorr Co.

Metallurgical Machinery:
Dwight & Lloyd Sintering Co.
The Dorr Co.
The Mine & Smelter Supply Co.

Metal Work, Heavy Plates:
Can. Chicago Bridge & Iron Co., Ltd
Horton Steel Works, Ltd.
The William Kennedy & Sons, Ltd.

Mica:
Everitt & Co.

Mine Cars — See Cars, Mine:
The William Kennedy & Sons, Ltd.

Mining Engineers:
Hersey, M. & Co., Ltd.

Mining Requisites:
Dominion Wire Rope Co., Ltd.
Hadfields, Limited.
Hull Iron & Steel Foundries, Ltd.

Mining Ropes — See Cable:
Mine Surveying Instruments:
C. L. Berger & Sons.

Molybdenite:
Everitt & Co.

Motors:
Peacock Brothers, Ltd.

Nickel:
The Mond Nickel Co., Ltd.

Oil Engines — Reverse:
Canadian Ingersoll-Rand Co., Ltd.

Oil Storage Tanks — See Tanks:
Can. Chicago Bridge & Iron Co., Ltd.
Horton Steel Works, Ltd.
The Toronto Iron Works, Ltd.

Ore Handling Equipment:
Canadian Link-Belt Co., Ltd.
Canadian Mead-Morrison Co.
Herbert, Alfred, Limited.

Ore Sacks:
Northern Canada Supply Co.

Ore Testing Works: See Assayers & Chemists:

Ores & Metals—Buyers & Sellers of:
Geo. G. Blackwell.
Consolidated Mining & Smelting Co.
Everitt & Co.

Oils:
Hercules Powder Co.

Pavers:
Wettlaufers Brothers
Gutta Percha & Rubber, Ltd.
Laurie & Lamb.

Perforated Metals:
Hendrick Mfg. Co.
Canada Wire & Iron Goods Co
Greening, B. Wire Co.

Pillow Blocks:
Canadian Link-Belt Co., Ltd.

Pipes:
Consolidated Mining & Smelting Co
The William Kennedy & Sons, Ltd.

Pipe — Wood Stave:
Pacific Coast Pipe Co.
Mine & Smelter Supply Co.
Canadian Ingersoll-Rand Co., Ltd.

Piston Rock Drill—see Drills, Air & Hammer:

Plate Works:
Can. Chi. Bridge & Iron Co., Ltd
Hendrick Mfg. Co.
The William Kennedy & Sons, Ltd
Horton Steel Works, Ltd.

Platinum Refiners:
Goldsmith Brothers.

Pneumatic Tools:
Canadian Ingersoll-Rand Co Ltd
Herbert, Alfred, Limited.
Holman Bros., Ltd.

Portable Column Hoists: see
Canadian Ingersoll-Rand Co., Ltd
Denver Rock Drill Mfg. Co
Herbert, Alfred, Limited
Holman Bros., Ltd.
Sullivan Machinery Co.

Poultry Netting:
Greening, B. Wire Co., Ltd.

Power Factor Correcting Devices:
Griswold & Co

Power Condensers:
Griswold & Co

Prospecting Mills & Machinery:
Mine & Smelter Supply Co

Pulleys Shafting and Hangers:
The William Kennedy & Sons Ltd

Pulverizers — Laboratory:
Herbert, Alfred, Limited
Holman Bros., Ltd.
Mine & Smelter Supply Co.

Pumps — Pneumatic:
Canadian Ingersoll-Rand Co Ltd
Smart-Turner Machine Co
Sullivan Machinery Co.

Pumps — Steam:
Canadian Ingersoll-Rand Co., Ltd
Northern Canada Supply Co
Peacock Brothers, Ltd.
Smart-Turner Machine Co

Pumps-Turbines:
Smart-Turner Machine Co.
Canadian Ingersoll-Rand Co Ltd
Laurie & Lamb.
Peacock Brothers, Ltd.

Pumps-Vacuum:
Canadian Ingersoll-Rand Co Ltd
Smart-Turner Machine Co
Peacock Brothers, Ltd

Pumps — Boiler Feed:
Canadian Ingersoll-Rand Co., Ltd
Smart-Turner Machine Co.
Peacock Brothers, Ltd.

Pumps — Centrifugal:
Canadian Ingersoll-Rand Co., Ltd
Laurie & Lamb.
Peacock Brothers, Limited.
Smart-Turner Machine Co.

Pumps — Diaphragm:
The Dorr Company.
The William Kennedy & Sons, Ltd

Pumps — Electric:
Canadian Ingersoll-Rand Co., Ltd
Laurie & Lamb
Peacock Brothers, Ltd
Smart-Turner Machine Co.

Pumps — Sand & Slime:
Canadian Ingersoll-Rand Co., Ltd
Laurie & Lamb
Mine & Smelter Supply Co.
Smart-Turner Machine Co.
Sylvester Mfg. Co., Ltd.

Pumps — Valves:
Peacock Brothers, Ltd.

Push Cars — See Cars, Push:
Sylvester Mfg. Co.

Quarrying Machinery:
Canadian Ingersoll-Rand Co., Ltd.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Sullivan Machinery Co.

Rails:
Hadfields, Limited.
John J. Gartshore.

Refiners:
Goldsmith Brothers

Riddles:
Hendrick Mfg. Co.

Rod Mills:
Mine & Smelter Supply Co.

Roll Shells:
The William Kennedy & Sons, Ltd.
Canadian Steel Foundries, Ltd.

Rolls — Crushing:
Canadian Ingersoll-Rand Co., Ltd.
Everitt & Co
Hadfields, Limited.
Hull Iron & Steel Foundries, Ltd.
Herbert, Alfred, Ltd.
Holman Bros. Ltd.
Wettlaufer Bros.

Roller Chain:
Hans Renold of Canada, Ltd.
Canadian Link-Belt Co., Ltd.
Jones & Glassco, Regd.

Rope — Manilla & Jute:
Jones & Glassco, Regd.
Allan, Whyte & Co.

Rope — Wire:
Anglo Canadian Wire Rope Co.
Allan, Whyte & Co., Ltd.
Canada Wire & Cable Co.
Canada Wire & Iron Goods Co.
Dominion Wire Rope Co., Ltd.
Greening, B. Wire Co.

Saline Refiners:
Goldsmith Brothers.

Samplers:
Canada Metal Co.
Ledoux & Co.
Milton Hersey Co.
Thos. Heyes & Son.
Mine & Smelter Supply Co.

Screens:
Canadian Ingersoll-Rand Co., Ltd.
Greening, B. Wire Co.
Hendrick Mfg. Co.
Canada Wire & Iron Goods Co.

Screens — Cross Patent Flanged Lip:
Hendrick Mfg. Co.

Screens — Perforated Metal:
Hendrick Mfg. Co.

Screens Shaking:
Canadian Link-Belt Co., Ltd.
Hendrick Mfg. Co.

Screens — Revolving:
Canadian Link-Belt Co., Ltd.
Hendrick Mfg. Co.
The William Kennedy & Sons, Ltd.

Separators:
Smart-Turner Machine Co.
Mine & Smelter Supply Co.

Sewer Pipes:
Wettlaufer Bros.

Shaft Contractors:
Hendrick Mfg. Co.

Sheet Metal Work:
Hendrick Mfg. Co.

Sheets — Genuine Manganese Bronze:
Hendrick Mfg. Co.

Sheets and Dies:
Hull Iron & Steel Foundries, Ltd.
Peacock Brothers, Ltd.
The William Kennedy & Sons, Ltd.

Ship Loaders: see Conveyors
Canadian Mead-Morrison Co.

Silent Chain: See Chain Drives
Silent & Steel Roller—See Roller Silent Steel.

Sledges:
Canada Foundries & Forgings.

Sintering:
Dwight & Lloyd Sintering Co., Inc.

Smelters:
Goldsmith Bros.

Smoke Stacks:
Can. Chicago Bridge & Iron Co., Ltd.
Horton Steel Works, Ltd.
Hendrick Mfg. Co.
The William Kennedy & Sons, Ltd.

Special Machinery:

Spelter:
The William Kennedy & Sons, Ltd.
Consolidated Mining & Smelting Co.

Sprockets:
Hans Renold of Canada, Ltd.
Canadian Fairbanks Morse Co., Ltd.
Canadian Link-Belt Co., Ltd.
Jones & Glassco, Regd.
The William Kennedy & Sons, Ltd.

Spring Coil & Clips Electric:
Canadian Steel Foundries, Ltd.

Stamp Batteries:
Herbert, Alfred, Limited.
Holman Bros., Ltd.

Stamp Forgings:
Canada Foundries & Forgings, Ltd.
Hull Iron & Steel Foundries.

Steel Barrels:
Smart-Turner Machine Co.

Steel Castings:
Canadian Steel Foundries, Ltd.
Canadian Brakeshoe Co., Ltd.
Hull Iron & Steel Foundries, Ltd.
Hadfields, Ltd.
The William Kennedy & Sons, Ltd.
Denver Rock Drill Mfg. Co., Ltd.
Sullivan Machinery Co.
Peacock Brothers Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Canadian Mead-Morrison Co.

Steam Hoisting Engines:
Canadian Mead-Morrison Co.

Steel Drums:
Smart-Turner Machine Co.

Steel Manganese:
Hadfields Ltd.
Hull Iron & Steel Foundries Ltd.
Canadian Steel Foundries, Ltd.

Steel Plate Construction — Light and Heavy:
Hendrick Mfg. Co.
The William Kennedy & Sons, Ltd.

Steam Engines — See Engines Steam:

Steam Traps:
Canadian Sirocco Co., Ltd.
Laurie & Lamb.

Steel-Tool:
N. S. Steel & Coal Co.
Hadfields, Limited.

Stone Breakers:
Holman Brothers, Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Denver Rock Drill Mfg. Co.
Herbert, Alfred, Limited.

Stone Quarrying Machinery:
Canadian Ingersoll-Rand Co., Ltd.
Denver Rock Drill Mfg. Co.
Sullivan Machinery Co.

Structural Steel Work — Light:
Hendrick Mfg. Co.
The William Kennedy & Sons, Ltd.

Sulphate of Copper:
The Mond Nickel Co., Ltd.

Surveying Instruments:
C. L. Berger.

Switches:
Canadian Steel Foundries, Ltd.

Switches and Turntables & Frogs:
John J. Gartshore.

Tables — Concentrating:
Mine & Smelter Supply Co.

Tanks:
Can. Chicago Bridge & Iron Co., Ltd.
Horton Steel Works, Ltd.

Tanks — Acid:
Can. Chicago Bridge & Iron Co., Ltd.
Horton Steel Works, Ltd.
Ontario Wind Engine & Pump Co.

Tanks — Wooden:
Gould, Shapley, & Muir Co., Ltd.
Ontario, Wind Engine & Pump Co.
Pacific Coast Pipe Co., Ltd.
Mine & Smelter Supply Co.

Tanks, Cyanide, Etc.:
Can. Chicago Bridge & Iron Co., Ltd.
Hendrick Mfg. Co.
Horton Steel Works, Ltd.
Ontario Wind Engine & Pump Co.
Pacific Coast Pipe Co.

Tanks — Steel:
Canadian Ingersoll-Rand Co., Ltd.
Can. Chicago Bridge & Iron Co., Ltd.
Horton Steel Works, Ltd.
Hendrick Mfg. Co.
The William Kennedy & Sons, Ltd.

Tanks — Oil Storage:
Can. Chicago Bridge & Iron Co., Ltd.
Horton Steel Works, Ltd.

Tanks — Water & Steel Towers:
Can. Chicago Bridge & Iron Co., Ltd.
Horton Steel Works, Ltd.
Ontario Wind Engine & Pump Co. Ltd.

Tires — Auto, Truck and Bicycle:
Canada Foundry & Forgings, Ltd.
Gutta Percha & Rubber, Ltd.
Hadfields, Ltd.

Trailers:
Sylvester Mfg. Co., Ltd.

Track, Manganese Steel:
Canadian Steel Foundries, Ltd.

Trackworks — (Manganese-Steel):
Hull Iron & Steel Foundries, Ltd.
Canadian Steel Foundries, Ltd.

Tramway Points & Crossings:
Hadfields, Limited.

Transformers:
Northern Electric Co., Ltd.

Transmission Appliances:
Jones & Glassco, Regd.

Transmission Machinery:
Canadian Link-Belt Co. Ltd.
Hans Renold of Canada, Ltd.
Jones & Glassco, Regd.
The William Kennedy & Sons, Ltd.

Troughs (Conveyor):
Hendrick Mfg. Co.

Trucks:
Hammant Steel Car & Eng. Works.

Tubs:
Hadfields, Limited.

Tube Mills:
Canada Foundries & Forgings, Ltd.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
The William Kennedy & Sons, Ltd.
Mine & Smelter Supply.

Tube Mill Balls:
Canada Foundries & Forgings, Ltd.
Holman Bros., Ltd.
Herbert, Alfred, Limited.
Hull Iron & Steel Foundries, Ltd.
Peacock Brothers, Ltd.
The William Kennedy & Sons, Ltd.

Tube Mill Liners:

Turbines — Waterwheel:

Turbines — Steam:
Laurie & Lamb.
The William Kennedy & Sons, Ltd.

Turbines:
Belliss & Morcom, Ltd.
Laurie & Lamb.
Herbert, Alfred, Limited.
Hull Iron & Steel Foundries, Ltd
Peacock Brothers, Ltd.
The William Kennedy & Sons, Ltd.

Turbo Blowers & Compressors:
Canadian Ingersoll-Rand Co., Ltd.

Uranium:
Everitt & Co.

Vacuum Pumps — see Pumps, Vacuum:

Ventilating Systems:
Canadian Sirocco Co., Ltd.

Vises:
Philip Gies Foundry.
The William Kennedy & Sons, Ltd.

Water Jet Drifting Drill:
Canadian Ingersoll-Rand Co., Ltd.
Sullivan Machinery Co.

Welding — Rod & Flux:
Prest-O-Lite Co. of Canada, Ltd.

Wheels and Axles:
Hadfields, Limited.
The William Kennedy & Sons, Ltd.

Winches — Power Driven:
Canadian Mead-Morrison Co.

Winding Engines — Steam & Electric:
Canadian Ingersoll-Rand Co., Ltd.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Anglo-Canadian Wire Rope.
Canada Wire & Cable Co. Ltd.
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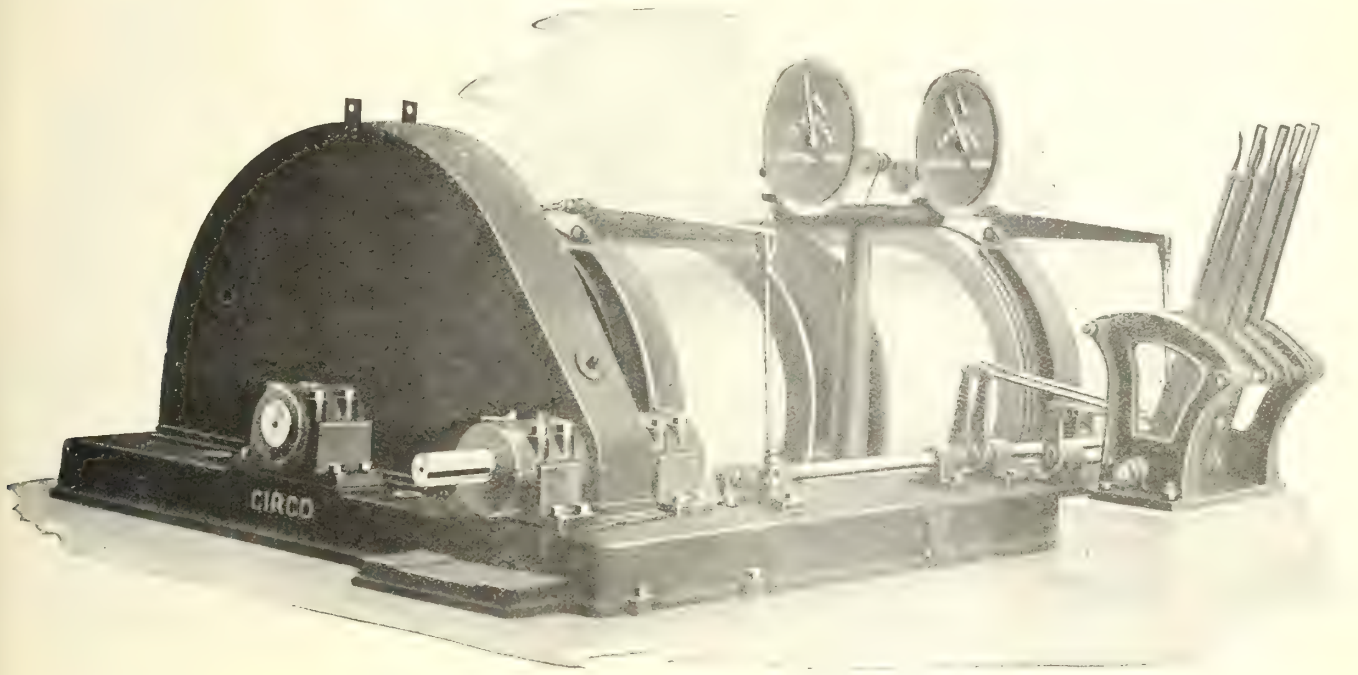

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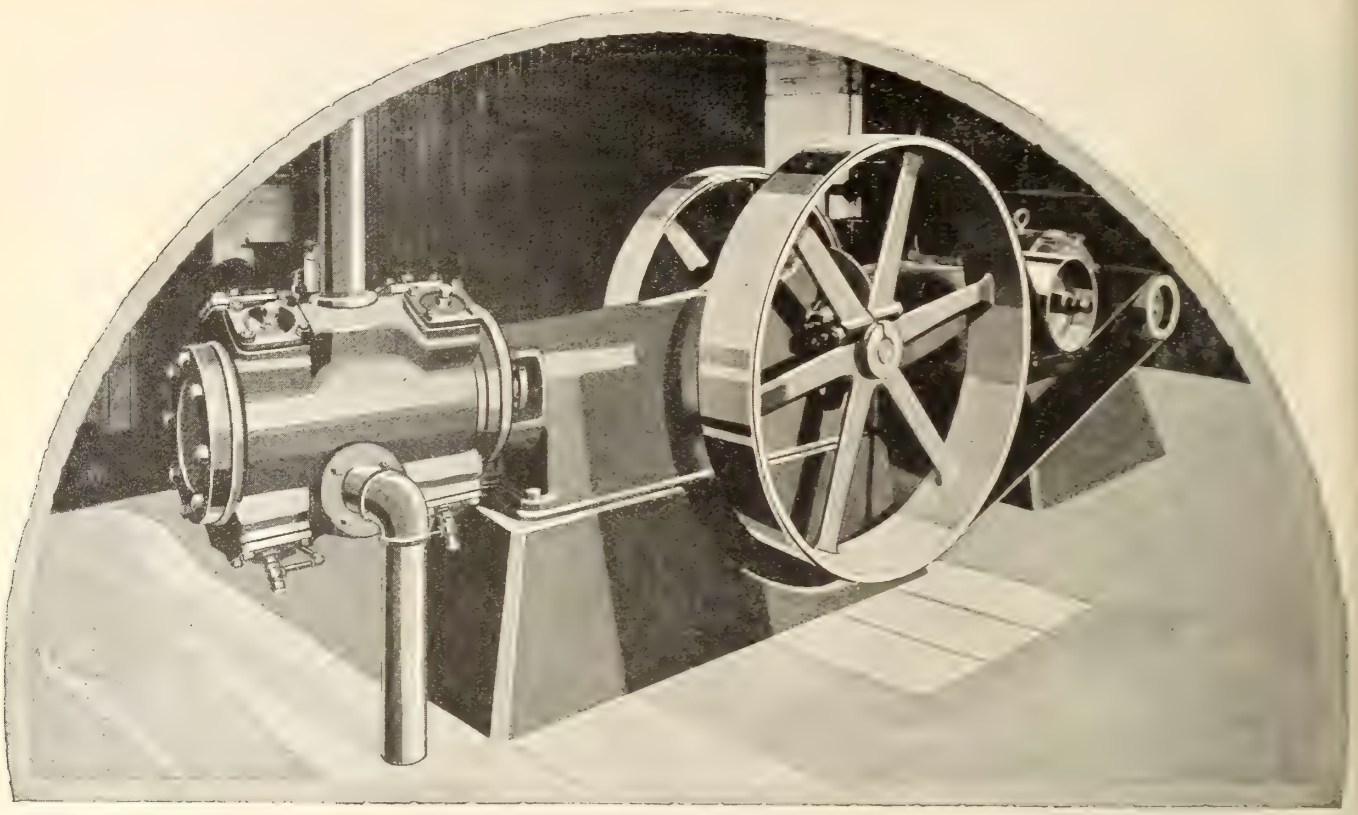

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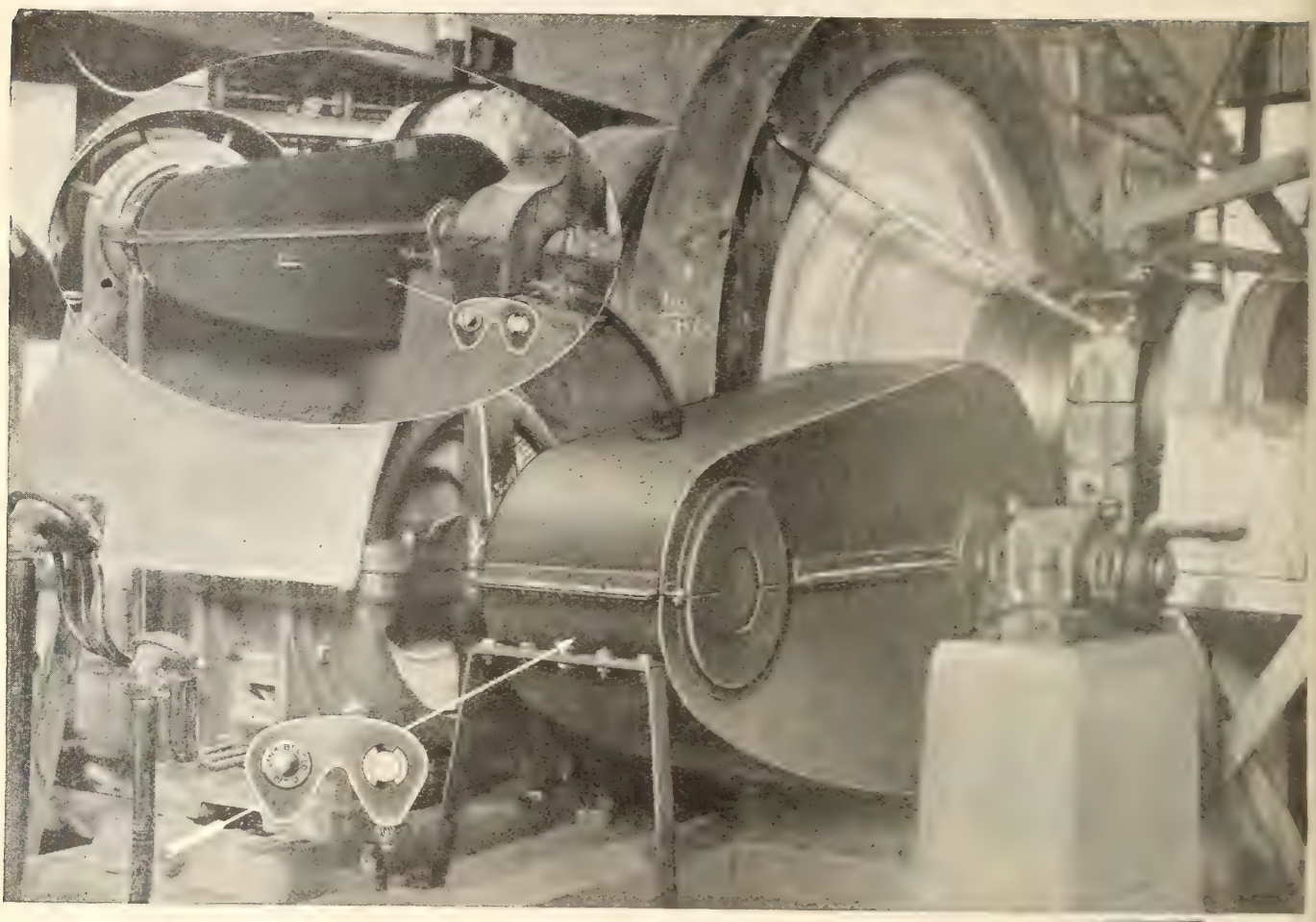

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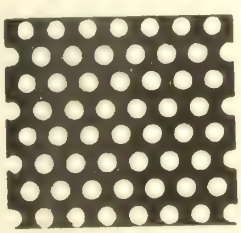

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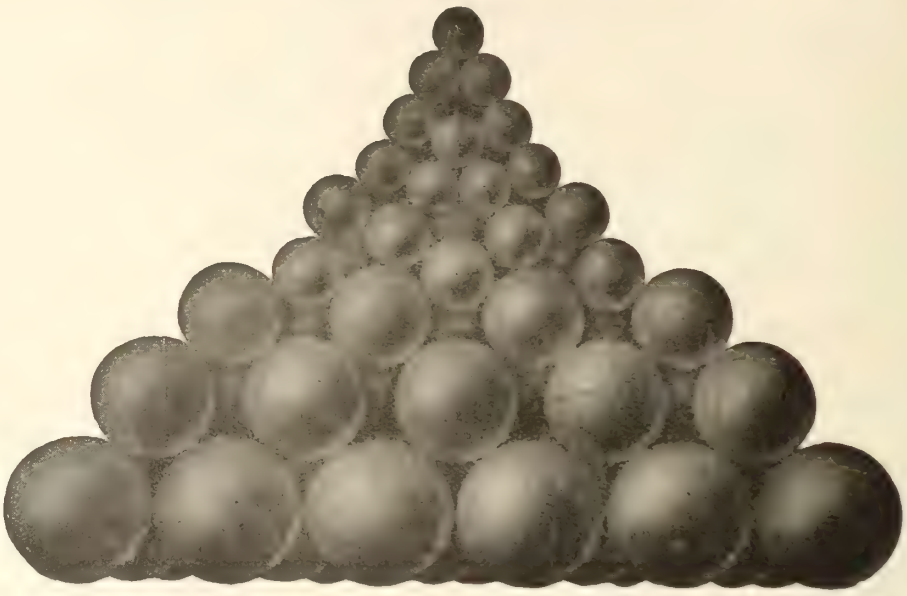

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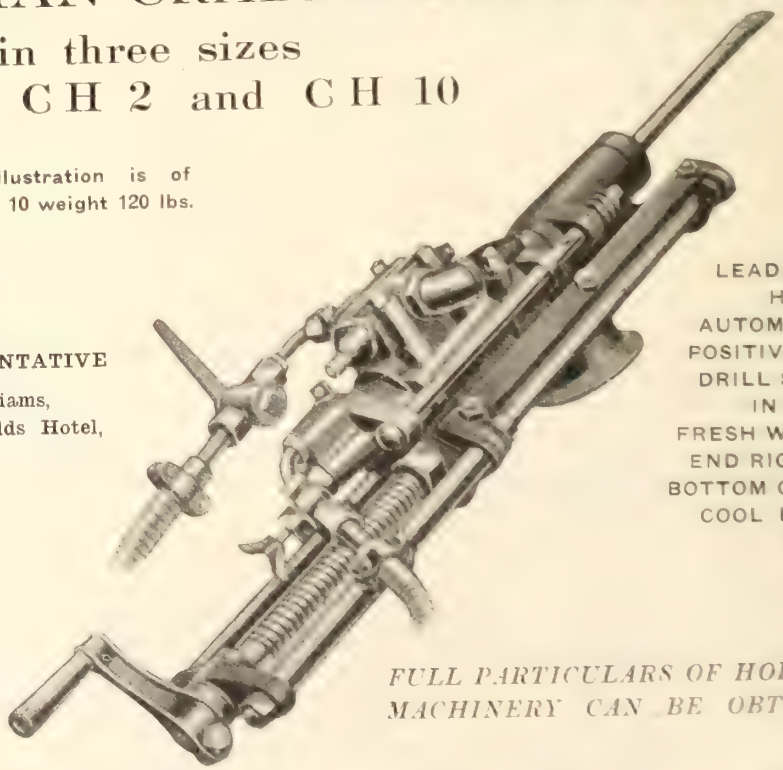

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THE GOULAIS IRON ORE DEPOSIT

A press report to the effect that a party of prospective investors, accompanied by Mr. J. D. Jones, general manager of the Algoma Steel Corporation, have recently inspected the deposit of iron ore near mile 60 on the Algoma Central Railway, draws attention to the strategic position and potential importance of this deposit. It is a magnetic iron range, a few miles only from the railway, sixty miles north of Sault Ste. Marie. Its future as a possible important producer of iron ore was realized only three years ago, when it was staked and examined in a preliminary way. The first superficial examination has disclosed a vast amount of siliceous magnetite, uniform in quality, free from deleterious impurities, and amenable to modern processes of concentration.

This deposit is in an unusually favourable position to supply the blast-furnaces at Sault Ste. Marie. A single railway haul of sixty miles direct from mine to furnace is much less than the transportation expense to which the present supply of ore is subjected. The necessary investment in a spur line is slight in comparison with the object to be attained. The ore deposit is capable of producing a large annual tonnage for a century or more.

Progress in making use of this Goulais River deposit of magnetite depends essentially upon one factor, the cost of making sintered magnetic concentrate. Should the present large experimental plant at Babbitt, Minnesota, prove to be a commercial success, there is no reason why its success should not be duplicated in Canada. Such a plant in this country would, to be sure, have to be smaller than that contemplated in the United States; but it would be more conveniently located with regard to shipment of ore, and would not require the huge initial investment necessary in the case of the pioneer plant. We are confident, also, that, were a well-rounded and obviously feasible scheme of ore production in Ontario proposed by substantial operators and investors, the Ontario or Dominion Governments, or both, would help to put it into effect by means of a bounty or similar subsidy.

The time is at hand when we can expect some definite and effective action with regard to the production of iron ore in Canada, and particularly in Ontario. Mr. Jones has indicated by practical calculations that the calcined siderite of Michipicoten and sintered magnetic concentrate can be used alone in various proportions to produce whatever variety of iron is required from the blast-furnace. One hundred million tons of siderite at the Helen Mine awaits a plant to turn it into merchantable ore; the process is proved, and there is required only a comparatively slight aid in the way of subsidy to ensure commercial success. If there should be demonstrated during the coming months the fact that the beneficiation of magnetic ore is similarly feasible, then there will be no reason whatever why the taxpayers of Ontario and of Canada should not dip into their pockets to the very slight extent required to establish firmly within our borders the one great basic industry of first-rate national importance for whose support we are at present utterly dependent upon foreign sources of supply.

THE STRIKE AT SYDNEY

The long expected "show-down" has come in Sydney. The workmen of both the steel plant and the collieries have decided to pit their strength and endurance against that of the British Empire Steel Corporation. The officers of the Corporation appear to realize that they can make no concessions, outside of relinquishing their ownership and control of their shareholders' property, that will permanently satisfy the socialist leaders of their workmen. The fact that the public, as represented by police and military forces, have been brought to the scene of the strike in sufficient numbers to protect the threatened plants and mines is sufficient evidence of the Corporation's determination to see this matter through to a finish—at last.

The presence of large military and police forces in and about Sydney points also to another fact — a fact of which the "red" strike leaders are not fully aware. It demonstrates the fact that the Canadian public, through their accredited representatives, are determined that the laws of this land shall be observed, and that the ancient and eminently useful institution of private ownership shall be preserved. In the final analysis it is the rights of private ownership that the strikers have called in question. They may claim that it is other rights of their own for which they are contending; but a careful scrutiny will show that, apart from some comparatively trivial matters, their contentions are based upon the principles of Karl Marx — the principles that rule the Russia of today. During the coal miners' strike of last year, which was terminated by a compromise that indicated a drawn battle and a resumption of hostilities, the same principle was at stake; but it is now

evident that our public representatives were not then so well aware of the fact as they are at present. The case is clearly one of British democracy versus Bolshevism.

At various critical junctures during the last two years of struggle between the workers' leaders and the representatives of investors in Nova Scotia, it has appeared to us unwise to have given rein so freely to the demagogues that at present hold such powerful sway. In one settlement after another the well-organized miners have been conceded the essential point of their demands, with the inevitable result that they have grown to believe they can force almost any concession from the company that pays their wages. Now we see that this policy of drifting along on the basis of a patched-up settlement has more to recommend it than appeared at first sight. It illustrates a propensity peculiar to British democracy — one that has accomplished more in settling acute labour problems in Britain itself than have other methods in any part of the world. The public is the final arbiter of any large-scale labour dispute such as this; and it is necessary, evidently, that the dispute shall have reached a very acute stage before the interest of the public has been roused sufficiently to exercise its judicial function. Sufficient public interest in the present case has now been stimulated, we take it, to ensure a permanent and judicial settlement.

* * *

Meantime events in the industrial area of Cape Breton have moved rapidly. The steel strike has collapsed and the furnaces and mills are at work again, due fundamentally to the fact that one-third of the employees remained at work. The plant has been idle or running at reduced capacity for so long that most of these men are on the verge of destitution and can ill afford a strike, however, just the cause. In this case the cause is of doubtful merit, and the spectre of hunger has proved a more potent persuader than the arguments of radical leaders.

The arrest of McLachlan and Livingstone is long over-due. At last, however, their published libel on the provincial police has proved their undoing. It is a well recognized fact in Sydney that most of the talk of these and other radical labour leaders has been a fabric of lies, and even their dupes among the rank and file of the miners' union are beginning to realize this fact. When the whole truth is made known to the misguided miners, we shall see the "red" leaders, elected with such demonstration last year, deposed and the more moderate leaders re-installed in control.

John L. Lewis has sent a definite order to the U. M. W. A. executive in Nova Scotia to call off the strike and return to work. A refusal on the part of the District executive will involve their being outlawed by the International union. If this should happen, the miners will be brought safely back to the U. M. W. A. fold the quicker; for the demonstrated faithlessness of the Nova Scotia "reds" means that ostensible submission would signify merely a continuance of plotting against the headquarters at Indianapolis.

Precipitate and ill-advised action on the advice of extremist leaders has led the workmen of Cape Breton into a situation from which they cannot escape. The steel workers have submitted to the inevitable with sufficient grace to ensure them generous treatment from the British Empire Steel Corporation. The miners, longer supplied with the intoxicating liquors of Bolshevism, have committed themselves more deeply and with less reason than their fellow-workers. They can expect sterner justice from the national and provincial governments whom they have defied and from the company whose property they have sought to destroy.

FREIGHT RATE ON ALBERTA COAL REQUIRES INDEPENDENT INVESTIGATION

Today we print, on another page, an official resumé of the interim report of the Dominion Fuel Board. As we have noted before in these columns, this excellent report deals fully and fairly with the various phases of the problem, with the exception of the transportation to Ontario of Alberta coal. A solution of this phase of the problem would put in sight complete fuel independence for this country. A solution is, however, not yet in sight.

The report of the Dominion Fuel Board did not discuss the question of freight rates on Alberta coal. The only really definite evidence available is that from the traffic departments of our two railway systems, who agree that the cost of hauling the coal to Ontario would be about $9.00 a ton, a prohibitive rate. Accepting this evidence as final, one must conclude that the only hope of getting Alberta coal into Ontario is by means of a subsidy that will reduce the freight rate. Such a subsidy would involve political policy and an Act of Parliament, and thus would be beyond the scope of the Dominion Fuel Board. It is this conclusion, presumably, that has led the Board to omit from its report discussion of this all-important topic.

The House of Commons Committee on Mines and Minerals, representing a political body, has not found itself under the same stricture as the Dominion Fuel Board. In its final report on June 27th, after hearing a great deal of evidence on the fuel question, it made the following recommendation to Parliament: "Your "Committee further recommends that the Govern- "ment undertake an independent investigation imme "diately, through whatever channels it deems best, "to ascertain the actual cost of carrying coal from "eastern and western points to Central Canada. We "believe that our National Railway should carry fuel "at cost in this crisis, and your Committee suggests

" that the rates quoted are not cost rates but much " higher." Western Canada was strongly represented on this Committee, so it may be that their conclusion is directed more by hope than by unbiased judgment.

Meantime, so far as the public are concerned, the point remains unsettled The railway operators say $9.00 is the cost of hauling the coal. Some other transportation specialists say that, by means of using the proper facilities, a much lower cost price can be attained. As the House of Commons Committee pertinently remarks, the importance of the conclusion involved, upon which hinges virtually the supply of a large part of Ontario's coal supply from Canadian mines, warrants the expense of an independent and thorough investigation.

INVESTIGATION OF DOMESTIC COKE MANUFACTURE

A second important item in our fuel problem is the conversion of bituminous coal into a high-grade domestic fuel-coke. The conclusion on this point is clear; it can and will be done. Early last spring the British Empire Steel Corporation undertook to investigate the point for themselves, and engaged the services of the Koppers Company for this purpose. The result is set forth in a letter from Mr. R. M. Wolvin, President of the British Empire Steel Corporation, to Senator McLennan, chairman of the Senate's Fuel Committee. In this letter he states that it is entirely feasible to transport Nova Scotia coal to such centres as Montreal, Quebec and Toronto and there turn it into coke, and to clean the gas for domestic or industrial use. He suggests trans-shipping coal at Montreal from seagoing colliers to the canal-size boats that otherwise would return empty to Port Colborne. Mr. Wolvin's conclusion would have borne more weight had he not added that "it will be necessary for the Canadian Gov- " ernment to assist this new business by bonus on coke " produced from Canadian coal or by subsidising such " plants using Canadian coal in a way possibly similar " to the Dry Dock Subsidies."

The Dominion Fuel Board have arrived at the same conclusion with regard to the provision of domestic coke, and in their interim report stress this as the main issue in the "acute fuel area." They do not count upon the exclusive use of Canadian bituminous coal for this purpose, as that would, no doubt, depend upon such a subsidy as Mr. Wolvin suggests throughout the central and western parts of Ontario. Their interim report points out that, whatever the source of this bituminous coal, it is desirable to turn it into its derivatives, coke, gas, ammonium sulphate and minor by-products, in place of using it in the raw state. To arrive at a sound conclusion on this point they engaged the services, last spring, of authorities in the United States who have investigated this selfsame question in various centres of population in that country. A survey of certain Canadian centres has led to the conclusion stated in brief in the interim report. The survey is in progress in other centres, and when the Board issues its final report we can be confident that its conclusions with regard to the manufacture of domestic coke will be as complete and as authoritative as it is possible to have at this time. It should be noted, by the way, that this preliminary report has been issued with unusual expedition after the appointment of the Board. The secret of this speed is probably to be found in the fact that it has consistently taken advantage of the knowledge of the best constituted authorities, rather than make independent investigations, which might consume years to gain the same end. Thus, whatever the success of Alberta coal in Ontario, the urban communities in eastern Canada with a population of 100,000 or over can look forward confidently to being supplied soon with high-grade fuel and cheap gas, and the surrounding agricultural districts to an abundant supply of fertilizer, all from bituminous coal.

A research association for the advancement of their trade, is the aim of the clothing designers of Canada and the United States. This is the gist of a report emanating from their annual convention held in Toronto last week. So it looks much as if Canada's clothing designers, by virtue of their association with their fellows in the United States, where research is the vogue in industrial circles, were to be the first in this country to benefit from this modern aid to progress. Apparently the mining, iron and steel, chemical, metallurgical, and all our other industries can afford still to rely upon individual effort. We doubt that their conclusion is sound.

ROUYN, OR WHAT'S IN A NAME?

Where wolverines their greed assuage,
  Where gambols portly Bruin,
Where moose live to a goodly age,—
  (The place I mean is "Ruin")—
Where there is neither shop nor house,
  Where one can't get Chop Suey,—
That hash of cabbage, cat, and mouse,—
  (I now refer to "Rouee")—
Where white the moon smiles down on men,
  The silvern, northern moon,—
(Where time and time and time again
  One hears the name called "Roon",)—
'Tis there, 'tis there, that I would be,
  Far, far from human clatter:
(And not one tinker's dam to me
  Pronunciations matter.)

J. C. M.

The Collieries of British Columbia

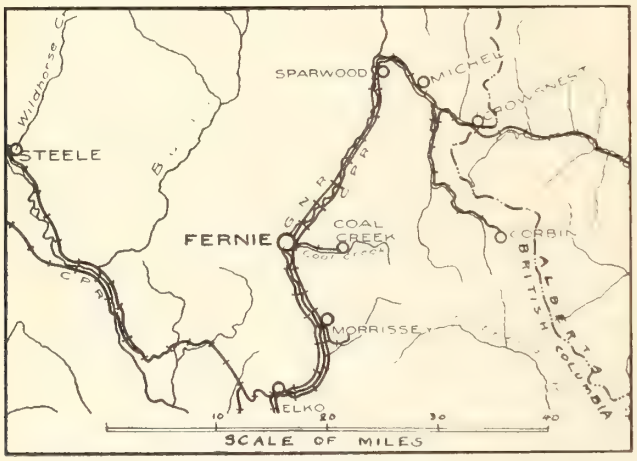
I — The Crow's Nest Pass Coal Field

By ROBERT DUNN

Of the coalfields of British Columbia in which there is active mining the most important is that of the Crow's Nest Pass, situated immediately west of the summit of the Rocky Mountains. The accompanying sketch indicates the chief mining centres of the district. The area of Cretaceous rock in this vicinity is nearly 500 square miles in extent. In relation to the remainder of the Province this field may be said to be located practically on the eastern boundary, between British Columbia and Alberta, and in the extreme eastern part of the Kootenays.

First Colliery Established in 1900

No. serious exploitation of the measures took place until the year 1900, the Crow's Nest Pass Coal Company having been floated shortly before that time. Since then the industry has been well maintained and, while it cannot be said to have grown in marked degree during the past few years, the collieries of the Crow's Nest



Sketch Map to show Location of Mines in Crow's Nest Pass Coal Field

have been one of the outstanding factors in western industrial progress. Up to the year 1908 the Crow's Nest Coal Company was the only company actually producing coal. In that year the Hosmer Mines Ltd. and the Corbin Coal & Coke Co. Ltd. were launched. The Hosmer Company closed down operations in 1914 and the plant has been idle ever since. The reason given for this was bad overhead conditions in the mine, the pressure being so great, it is stated, that it was found impracticable to proceed with underground development.

The original company, Crow's Nest Pass Coal Company, has operated without cessation ever since becoming established. This is not to say that the enterprise has been without its vicissitudes, for work has been interfered with over considerable periods by strikes, accidents and like occurrences; but on the whole, coal has been mined steadily over the period named. The Corbin Coal & Coke Company also has operated continuously since 1908. These two companies have produced from their various mines up to the present 4,887,196 tons of coal and 759,393 tons of coke.

Geology of the Area

Mr. James McEvoy, in a report for the Canadian Geological Survey in 1900, states that the coal-bearing horizon of the Crow's Nest coalfield is what is known as the Kootenay formation, and occurs in synclinal form covering an area of 230 square miles, surrounded by tilted beds of earlier geological periods. As a result of erosion the Kootenay and overlying strata form an elevated plateau-like area bordered by depressions occupied by older beds. He continues:

"Most of the heavy coal seams occur in the lower 2,000 feet of the Kootenay. On Sparwood ridge, near Michel, a further thickness of 2,000 feet in the upper part of the measures contains a number of thin seams, mostly cannel or coal having a high percentage of volatile matter. The Morrissey section at the south gives a thickness of 3,700 feet of coal-bearing beds. The covering beds are mostly coarse sandstones and conglomerates and are of great thickness.

"The coal content, in natural sections at a number of places, including only seams over one foot in thickness, is as follows:— At Morrissey 23 seams give 216 feet of coal in 3,676 feet of measures. At Fernie 23 seams give 172 feet of coal in 2,250 feet of measures. At Sparwood 23 seams give 173 feet of coal in 2,050 feet of lower measures. At Sparwood 24 seams give 43 feet of coal in 2,015 feet of upper measures."

The Pioneers

Two names are prominently associated with the early history of coal mining in the Crow's Nest. One is Lt. Col. James Baker, who was Minister of Mines and Education and Provincial Secretary in the administrations of Theodore Davie and J. H. Turner and who came to British Columbia in 1884. The other is William Fernie, a prospector, who had discovered and been impressed by the coal riches of the district and who was responsible for inspiring Col. Baker with his enthusiasm. Both these pioneers have passed to their reward, the first mentioned retiring to England after having seen his enterprises successfully brought to fruition, and the latter ending his days in Victoria, confortably sustained by the yield of his energy and business acumen.

It was in 1887 that Mr. Fernie told Col. Baker of his discovery of a 14-foot seam of coal while engaged in cutting a trail through the Crow's Nest Pass. To recount in detail all that grew out of that conversation would take considerable space and possibly would bore the reader. In brief, a syndicate was formed; the area was well explored and many other promising outcrops were located; approximately 11,000 acres of land was purchased at $1 an acre; and then Col. Baker tackled a very serious phase of his problem, viz. the provision of transportation.

There was no doubt as to the existence of the coal; nor was there any doubt regarding its quality; but it must be remembered that in these early days in this part of the country the means of carrying the commodity to market were lacking. The difficulty then confronting the Crow's Nest Pass was analogous to the difficulty that now is being met with by those who would exploit the coal measures of the Ground Hog district in the far northern part of British Columbia. The presence of large coal seams had been proven; how could the product be brought to the consumer at a profit?

Railways Built by C. P. R.

Two companies were formed in 1888, one the Crow's Nest Pass Railway Co. and the other the Crow's Nest Coal Co., the latter holding the 11,000 acres of coal land. A railway charter was granted by the Provincial Legislature. Nothing, however, was done immediately, and in 1890 the British Columbia Legislature passed the "Railway Aid Bill" under the terms of which a grant of 20,000 acres per mile of railway constructed was offered in order to encourage the building of a railway that would tap the district by way of the Pass. Every possible effort was made to induce eastern financial men to take up this offer. These endeavors, however, were unsuccessful and finally the Canadian Pacific Railway agreed to construct the road providing a subsidy was granted by the Dominion Government. The agreement of the C. P. R. provided that that Company was to pay $100,000 for the provincial railway charter, that this sum was to form working capital for the development of the coal mines, and that they were to hand over the coal lands attaching to the railway land grant and amounting approximately to 170,000 acres, besides a block of land of about 400,000 acres useful, it is stated, only for timber for the mines. The C. P. R. retained 6,000 acres of the best coal land on condition that they should not work the same so long as the coal company provided coal at a profit not exceeding 75c a ton. The C. P. R. was granted a subsidy by the Dominion of $11,000 per mile, but the Dominion held 50,000 acres of land, the coal content of which was not to be exploited providing cheap coal was sold by the company.

This, then, was the genesis of coal mining in the Crow's Nest. Anyone who has been through that country is aware of the remarkable changes that have since taken place. The hub of the industrial area is Fernie, a thriving community on the banks of the Elk River and in daily communication by railway with the southern cities of Alberta to the east and the substantial city of Spokane, Washington State, to the south. Surely the conditions have radically altered since the summer of 1887 when Col.Baker and William Fernie first discussed the development of the coal of the region, and no doubt had clear visions of what the future might be expected to bring forth under the compelling force of industry. Col. Baker was an English gentleman with little idea of western Canadian life when first he arrived in this country. His first intention was to go ranching, and to carry out that purpose he purchased a large tract of land some distance south of the Crow's Nest, a part of which now is the site of Cranbrook. It was not long before he was drawn into the vortex of western life, and we find him not only taking a firm grip of the problem of coal development, but also a very active and leading part in the public life of the Province.

Crow's Nest Pass Coal Co.

At the head of the Crow's Nest Pass Coal Co. is W. R. Wilson, who for years has been associated with the company, first as General Manager and later as President. The Company is operating the Coal Creek Colliery, on Coal Creek, about 5 miles from Fernie, and the Michel Colliery, on Michel Creek, about 23 miles northeast of Fernie.

Coal Creek Colliery of the Crow's Nest Pass Coal Company

In connection with the Coal Creek operations there are seven mines, three on the north side and four on the south of the creek. The Morrissey Fernie & Michel Railway gives Fernie connection both with the Canadian Pacific and the great Northern Railways. Coal trains are run over a short line from Fernie to Coal Creek and in addition a regular passenger service is maintained for the convenience of workmen, most of whom live in Fernie. Dwellings, however, are provided at Coal Creek for those who prefer to live near the mines.

Method of Mining

The seven mines referred to are Nos. 1 East, 1 South, 1 North; Nos. 2, 3, 9 and B North. No. 1 Mine operate in No. 1 Seam, which varies from 30 to 40 ft. in thickness, only 10 ft. of the upper portion being worked. Nos. 2, 3 and 9 mines are mining the No. 2 seam which has an average height of from 6 to 9 feet; while B North is working the B seam which is about 5 ft. thick, height being obtained for haulage by lifting from 3 to 4 ft. of bottom, this consisting chiefly of inferior coal and shale. The general method of work is pillar and stall, entries being driven in pairs, from which rooms are set off three to a panel, large pillars being left between each pair of entries and set of rooms. All the coal is

mined from the solid, no pillars having been drawn. Inside the mines the haulage is by horses from the working faces to convenient partings, from which the loaded cars are conveyed to the tipple by low pressure, compressed air hoist, compressed air locomotives, endless rope haulage, and gravity planes. The Edison type electric cap safety lamp is in general use, although there are Wolf safety lamps for officials and brattice men for testing purposes. The tipple at this colliery is of steel construction, has a total length of 840 feet, extending right across the valley, and receives coal on both sides; it is equipped with two independent electrically driven circular dumps, which deliver the coal to feed-conveyors that supply the shaking screens. These separate the slack from the lump coal, the latter being delivered to the picking-tables, where all foreign material is picked out before it is finally loaded into the railway-cars.

Provision is made for loading into either open or box cars, two Smith hydraulic box-car loaders being provided for dealing with the latter.

Equipment at Central Plant

The main power plant is situated on the north side of the valley and consists of fourteen boilers, with an auxiliary plant of five boilers on the south side; the total capacity of the plant is approximately 3,250 horse-power. Power to drive the compressed-air hoists and pumps underground is supplied by three compressors having a total capacity of 6,000 cubic feet of free air a minute, compressing it to 80 lb. to the square inch. There is also a Canadian Ingersoll-Rand (high-pressure) compressor having a total capacity of 1,346 cubic feet of free air a minute, compressing it to 900 lb. to the square inch, which provides the power to drive the air-locomotives.

The electric plant consists of three generators with a capacity of 680 amperes at 250 volts, driven by two Robb-Armstrong engines, and provides the power to drive the fans at Nos. 1 South, 1 North, and B North mines, the motors on the tipple, as well as the electric light for the mine buildings, yards, and houses at Coal Creek.

A well-equipped lamp-room is located in a central position at the mines, where all safety-lamps are cleaned and repaired; this building is fully provided with all necessary appliances for keeping the lamps in a good state of repair. A large wash and change room is situated convenient to the mines, where the workmen can have a locker for a small monthly payment; these lockers are of steel construction, and the wash-house is under the charge of a workman whose duty it is to keep it in a clean and sanitary condition, the workmen providing their own soap and towel.

Descriptions of Separate Mines

No. 1 Mine is opened by a crosscut tunnel, which reaches the coal at a distance of 215 ft. from the entrance. A fan of the Wilson type provides ventilation, running at a speed of 146 revolutions a minute and delivering an average of 116,500 cubic feet of air per minute at a water gauge pressure of 3.5 inches. There are four splits in the mine and ventilation is good. Coal dust is kept down by spraying all roads and all working places where it is necessary. The main roads are regularly treated with ashes. John Caufield is the overman.

On the eastern and dip portion of the No. 2 seam is the No. 3 Mine, J. Biggs, overman. The coal is reached by a slope 2,500 feet in length from which the product is delivered direct to the tipple. Ventilation is furnished by a 16 x 8 ft. Wilson fan delivering some 55,900 cubic ft. of air per minute. A spraying system has also been adopted in this mine.

The western portion of No. 2 seam is opened up by No. 2 Mine, C. McNay, overman. This is on the same level as the tipple, to which loaded cars are delivered direct by compressed air locomotives. A Wilson fan delivers about 48,200 cubic feet of air a minute. The ventilation is split for two separate districts.

About half a mile to the west of the tipple and operating on the upper and western portion of No. 1 seam on the south side of the valley is No. 1 South Mine. All workings are to the rise of the main haulage road and driven toward the outcrop. An electrically driven 8 x 4 ft. Keith fan provides ventilation. It gives some 36, 360 cubic feet of air a minute. F. Landers is the overman.

No. 1 North Mine is operated on the western portion of the No. 1 seam on the north side of the valley and being close to the outcrop little trouble is experienced from gas. It is all on one split and ventilated by an electrically driven 7 x 4 ft. Keith fan producing an average quantity of 23,000 cubic feet of air a minute. J. Worthington is the overman.

The No. 2 seam on the north side of the valley is opened up by No. 9 mine, R. Fowler in charge. The principal recent work has consisted of driving two companion inclines with the intention of making connection with No. 1 North Mine and repairing the main return airway. A Guibal type fan giving some 7,400 cubic ft. of air a minute provides ventilation.

East of the tipple is No. B. North Mine, which is opened on the B seam. W. Commons is the overman. An electrically driven 10 x 3 ft. Brazil fan producing about 41,800 cubic feet of air a minute takes care of ventilation.

To be continued

PERSONAL AND GENERAL

Mr. A. S. McNeil, formerly General Superintendent of the Dominion Coal Company, has been appointed Assistant General Manager in place of Mr. H. J. McCann, who is seriously ill.

Mr. John Blizard, formerly on the staff on the Mines Branch, Ottawa, has resigned his position as fuel technologist with the Bureau of Mines, Washington, to take a post with a private company in New York.

Dr. Robert Harvie is engaged for the field season in mapping that section of the Rouyn gold field of northwestern Quebec lying to the north and east of Rouyn township. Other members of the Geological Survey are engaged in mapping the other map sheets covering the gold belt.

Colonel Crabbs, President of the Granby Company, on his recent visit to the Company's mines and plant at Anyox, B. C., took occasion to compliment those responsible for the community life of this little town. It is notoriously difficult to manage the affairs of a small and isolated community like this in such a way as to minimise personal friction and to stimulate a normal and sound outlook on life. Colonel Crabbs has corroborated the expressed opinion of other observers, that the spirit of good fellowship as well as of loyalty to the Company has reached a remarkable state of development in Anyox.

The world's present radium consumption is about 2 grams per annum. This supply can be more than met from the plant for the treatment of the rich Katanga radium ore at Oolen, near Antwerp, Belgium.

The Phospho-Potash Process

Method of Treating Potash Feldspar Worked out by F. D. S. ROBERTSON

Efforts are being made continuously to develop a commercially feasible process for extracting potash from feldspar. Eventually some such process is certain to be evolved. Canada is particularly favoured with deposits of potash feldspar of large size in easily accessible localities, and has at present no available source of potash. Consequently a solution of the problem is of decided importance to this country.

A method called the "Phospho-Potash Process" has been worked out recently in laboratory and small-scale experiments by Mr. F. D. S. Robertson, Metallurgist of Toronto, and patented. (Canadian Patent No. 191,260, July 1st, 1919, and U. S. patent No. 1,317,524, Sept. 30, 1919.) It consists essentially in the treatment of ground potash feldspar with phosphoric acid. The phosphoric acid attacks the silicate of potash and alumina, giving potassium phosphate, alumina and silica, the first being thereafter leached out with water. The alumina and silica are removed by filtering, and the solution of potassium phosphate is treated with sulphuric acid to give potassium sulphate and phosphoric acid. By evaporation the potassium sulphate is crystallized and separated, leaving the syrupy phosphoric acid ready to treat a further batch of feldspar. Thus, the products are pure potassium sulphate and a mixture of alumina and silica. This mixture can be separated readily into its component parts, alumia, which is readily saleable, and silica, which will have at least the value of fine silica sand. If advisable, the alumina can be treated with sulphuric acid to make alum, and the silica separated at the same time.

Laboratory Tests

The first tests in the series of experiments were made in the laboratories of the University of Toronto. A quantity of feldspar and apatite were obtained from deposits in Eastern Ontario and were ground to about 80 mesh. From the apatite phosphoric acid was made, and the feldspar was treated with this, as well as with pure phosphoric acid purchased. The initial tests were necessarily only on a laboratory scale and were made to ascertain the action of the acid upon the silicate and the feasibility of recovering the phosphoric acid for use again on fresh material. The result of these experiments es tablished the fact that phosphoric acid, under proper con ditions, attacks feldspar and other silicates and that under the right conditions, ninety-five per cent. or better extraction of the potash content is possible, and that the phosphoric acid could be used over again practically without loss.

Small Commercial Scale Researches

To determine the best conditions under which a satisfactory extraction could be made, a small plant was erected at Guelph, Ont., which consisted of a 75-gallon autoclave or digester fitted with a stirring device driven by an electric motor, large leaching vats, a wooden filter press (Shriver type), a series of open tanks (lead lined) for evaporating solutions and preparing phosphoric acid from the phosphate rock, pumps for transferring liquids, crusher and screens for reducing the materials. A small but complete chemical laboratoy for making control tests was installed. Several tons of feldspar was crushed to 80-100 mesh and also some high-grade rock phosphate. From the latter material a quantity of 47 to 50% acid was made and was used in the trials. It was soon found that, by using an excess of phosphoric acid, all of which is recovered and remains within the circuit, an extraction of at least ninety-five per cent of the potash content of the feldspar was readily effected. From the last four batches extractions varying from ninety-seven to almost one hundred per cent.. and averaging slightly over ninety-nine per cent. were made. The loss of phosphoric acid (which in the cases quoted all went into the sulphate of potash) did not exceed three per cent, and this was found recoverable, if required, by recrystallization. The various salts obtained from these operations were of a high degree of purity.

The process patents cover the treatment of feldspar, mine tailings or other source of potash-bearing material either by digestion under pressure in autoclaves (pressure digestion tanks) or by incipient fusion in furnaces provided with fume collectors. Though feldspar is the chief potash-bearing mineral in Canada, there are a number of other minerals of common occurrence in other countries that will probably be amenable to treatment by this new process. Glauconite (greensand), alunite, and sericite (potash mica), syenite and certain mine tailings are also suggested as possible sources of potash by this method.

The "Phospho-Potash Process" requires only cheap and easily obtained raw materials. The most expensive reagent, phosphoric acid, is regenerated and used over and over again. The only other reagent, sulphuric acid, is recovered completely as the sulphates of potassium and aluminium. Should commercial application prove that the process is economically as well as technically feasible, it will be of decided importance to the Canadian mineral industry.

NEW MAP OF MICHIPICOTEN DISTRICT

The Geological Survey, Ottawa, has issued a new map on a scale of a mile to the inch of the Michipicoten District, to the northeast of Lake Superior, which will accompany a memoir by W. H. Collins, now in course of preparation. Pending the publication of the report, the map will prove very useful.

The map-sheet includes the ground west of the Algoma Central railway for a distance of 20 miles, and from Michipicoten River northward for a distance of 25 miles, or within five miles of the Canadian Pacific Railway. It thus covers the huge siderite deposit at Helen Mine, the lesser siderite deposits in other iron ranges in the vicinity, the old gold camp in the vicinity of Michipicoten Harbour, and the western part of the new Goudreau gold camp.

This is the first official map of this important mineral district to be issued since 1905, when the Ontario Bureau of Mines had the area surveyed. Since that time the science of geology has made great strides, which are well indicated on the new map.

The "iron formation," which is such an outstanding geological feature of this district, has up to the present remained rather an engima to geologists, and especially so the huge lenses of siderite associated with the thin iron oxide and silica bands in this locality. Dr. Collins has made a special study of these deposits and no doubt his memoir will throw some light on the subject.

Field Work of the Geological Survey

By W. H. COLLINS, Director.

The Federal Department of Mines has had prepared by the Director of each of its three branches a statement of the present year's work in field and laboratory. That of Dr. Collins, for the Geological Survey, follows, and those of the Mines Branch and the Victoria Memorial Museum will appear in succeeding issues. — Ed.

Forty-eight parties have been placed in the field in various parts of Canada this summer by the Geological Survey, as compared with thirty-nine parties last year. The most northerly party is working in the Mackenzie river region, in latitude 65 deg. The westernmost one is located in Yukon territory and the easternmost in Nova Scotia. One of the principal objects of the work is to render scientific guidance to prospectors and explorers in their search for mineral deposits by providing them with dependable maps that show the geographical features and the distribution of the various rock formations, and with reports describing the mineral-bearing possibilities of these formations. Several of the parties are more particularly engaged in making inventories of Canada's resources of iron ore, petroleum, coal and other minerals. Nearly all, and more especially the topographical parties, are contributing to the exact, primary mapping of the country on scales suitable to future as well as present needs. This work, although restricted to mineral-bearing areas in which there is a present economic need for good maps, is being carried out with a view to serving all other needs and of forming part of the primary system of maps which Canada in common with all other civilized and industrialized countries eventually should have.

Concurrently with the examination of mineral deposits and the exploration of northern Canada, an opportunity is afforded to most of the parties to carry on the more purely scientific investigations which each year help to transform the exploration of our mineral resources from a haphazard search to one guided by definite principles such as the well informed agriculturist, for instance, already employs. It is a knowledge of such principles already determined which has in Sudbury district, Ontario, for example, confined the search for nickel-copper ore with extraordinary success to the edge of the body of igneous rock which gave off this ore, and in the same district has discouraged and prevented a fruitless and wasteful search for coal. A more recent practical application of geological principles is being made in northwestern Quebec, where the knowledge of the origin and geological relationships of gold-bearing veins learned in the adjoining region of northern Ontario is being applied with promising results by geologist and prospector. The field work of 1923 will afford numerous opportunities for scientific investigation of this nature.

The field work of the Geological Survey affords a good opportunity to students of geology in Canadian universities to make practical application of the information imparted to them in these institutions of learning. This year 77 students in geology and mining or civil engineering are being employed as field assistants. Ten of these are post-graduate students in Canadian and United States universities, to each of whom has been assigned a problem for research which will be initiated in the field during the summer and completed next winter under the supervision of the universities. This arrangement is as advantageous to the Survey as to the universities, for it secures exceptionally intelligent and willing assistance at no greater cost than ordinary labor.

Two of the 48 field parties are engaged in collecting mineral specimens and fossil remains for the national Victoria Memorial Museum, at Ottawa.

British Columbia and Yukon

W. E. Cockfield will investigate the rich silver-lead ore-deposits near Mayo, Yukon Territory, and the country around Beaver river, where discoveries of similar deposits have recently been made.

With the assistance of A. H. Bell he will also continue the geological mapping of an area of 5,000 square miles around Whitehorse which lies on the eastern edge of the Coast granite. This granite intrusion has been responsible for most of the metallic mineral deposits in western British Columbia and Yukon, and the territory marginal to it is particularly worthy of the prospector's attention. Deposits carrying copper, gold and silver have already been found in the section of the eastern margin near Whitehorse.

George Hanson will explore another section of the eastern margin of the Coast granite mass in British Columbia between the Canadian National railway and Portland Canal District, where the Premier gold mine and Anyox copper mine are located. This is in continuation of work commenced in 1922.

W. H. Miller will make surveys for a contoured topographical map, on a scale of one mile to the inch, of an area of about 200 square miles east of Hazelton and northwest of Smithers, on the Canadian National railway. This area contains promising deposits of copper ore and will be geologically mapped after the necessary topographic base-map has been prepared.

G. A. Young will continue a detailed investigation and inventory, begun last year in co-operation with the Department of Mines of British Columbia, of the iron ore resources of the province. It is proposed to study and inventory the iron ore deposits in a manner which will admit of determining whether there are enough ores suitably located and of satisfactory qualities to supply a future iron and steel industry on the coast, if other essential requirements for such an industry obtain. The possibility of establishing a Coast iron and steel industry has been under consideration at various times in recent years and a distinct need has arisen for reasonably accurate information regarding the basic requirements.

T. B. Williams will complete the detailed mapping and study of the structure and succession of strata in the Nanaimo coal basin, on the east side of Vancouver island. This field work was commenced in 1921 and concluded last year by the late J. D. Mackenzie, but his untimely death in December, 1922, prevented completion of his results for publication, and necessitated continuance of the work by Mr. Williams. The coal measures in Vancouver island are complicated by minor faulting and by the irregularity of the floor upon which they were laid down and a careful determination of the geological structure is required for the economical direction of mining operations. An estimate has also been made of the supplies of coal in the basin, as a contribution to the general inventory of the coal resources of Canada.

W. A. Johnston will continue the investigation and geological mapping of the gold-bearing placers and other

loose deposits near Barkerville and Cedar Creek, in the Cariboo district. Interest in the Cariboo placers which were discovered over 60 years ago has been quickened by the discovery last year of a rich section at Cedar Creek. The placers are mostly in gravels of an ancient drainage system of Tertiary age which has been replaced by a new stream system since the Ice age and concealed by the cover of boulder-clay left by the ice-sheet. An interpretation of this ancient drainage is therefore required for the rational prospecting of the placers. With this object in view a topographic map has been made of an area of about 200 square miles around Barkerville. Last year the bedrock formations in this area were mapped and the source of the placer gold investigated by W. L. Uglow, while Mr. Johnston commenced the mapping and study of the placers and other surface deposits which he will complete this summer.

C. E. Cairnes will continue a geological exploration of an area in southwestern British Columbia southwestward from Princeton, in which a variety of mineral deposits are known to occur.

V. Dolmage will make an intensive investigation of the Copper Mountain group of copper ore-deposits near Princeton. A detailed topographical map of the area on 1,000 feet to the inch was made last year by D. A. Nichols.

A. C. T. Sheppard will at the request of the Government of British Columbia make surveys for a detailed topographical map of Kokanee Glacier park, near Nelson. The surveys will also be extended to those already made of the Slocan and Ainsworth areas and will be a further contribution to the standard primary mapping of British Columbia, on the scale of one mile to the inch.

M. F. Bancroft and *J. F. Walker* will continue the systematic geological mapping of Windermere map-area. This work is part of a scheme of geological work which is aimed to correlate and unify the many isolated pieces of geological work in southern British Columbia and permit the compilation of one general geological map of this region. The Windermere area also contains deposits of gold.

Northwest Territories

G. S. Hume will complete a systematic geological exploration and investigation of the petroleum-bearing possibilities of the country accessible from Mackenzie river, which was commenced in 1921. The area to be explored this year lies just south of Fort Norman, where petroleum was found in 1920 and where further drilling operations will be carried on this year by the Imperial Oil Company. When this area has been finished fairly detailed information and maps will be available regarding all the navigable tributaries of the Mackenzie between Great Slave lake and Carcajou river and of the geology and general character of this stretch of country.

Dr. Hume will also investigate and sample deposits of clay, reported to be of good quality, which outcrop on Athabaska river below Fort McMurray.

Alberta

J. R. Marshall will continue the systematic geological mapping of the coal-bearing area in the eastern Rocky Mountains in the neighborhood of Kananaskis river. This work is contributory to a systematic investigation of the structure and distribution of the coal measures and an inventory of the coal resources of Alberta.

P. S. Warren will, at the request of the Parks Branch, Department of the Interior, study and map in detail the rock formations near Banff, more particularly with a view to ascertaining the source of the Banff hot springs and their relation to the geological structure. The upper spring has of late years become irregular and intermittent in flow. As these springs are an important attraction, consideration is being given to the possibility of restoring and maintaining their flow, and Mr. Warren will endeavor to ascertain what remedial action should be taken. The strata near Banff also include a phosphatic bed which may in places be rich enough to be used for making land fertilizer.

E. M. Kindle will assist P. S. Warren at Banff, J. R. Marshall in Kananaskis area, and M. F. Bancroft in Windermere area in determining the succession and age relationships of the rock formations in these areas.

D. B. Dowling will make a detailed study of the coal seams and coal measures in Wind Mountain, a few miles south of "The Gap," near Canmore, on the Canadian Pacific railway. These measures contain bituminous coal of unusually good quality for domestic use and would be particularly suitable for consumption in Ontario if transportation ever becomes practicable. Dr. Dowling will also investigate various occurrences of lignite in southern Saskatchewan and near Souris, Manitoba.

E. J. Whittaker and *M. Y. Williams* will commence a careful revision of the geology of southern Alberta with the object of preparing a map and sections which will show the thicknesses, structure and distribution of the various formations as accurately as available data permit, The strata contain coal seams and supplies of natural gas, petroleum and water and an accurate knowledge of the geological structure is required for guidance of exploratory boring operations.

F. H. McLearn will study in detail the geological succession of the Blairmore coal-producing area, which affords a key for the interpretation of the geology of the coal measures of Alberta, and their associated rock formations. He will also collaborate with Mr. Whittaker and Dr. Williams.

C. M. Sternberg will collect fossil remains of dinosaurs and other vertebrate animals near Red Deer for the Victoria Memorial Museum at Ottawa.

Saskatchewan

J. S. DeLury will commence mapping an area of about 500 square miles southeast of Lac La Ronge. The area includes one of the belts of schists which in northern Saskatchewan and Manitoba constitute the most favourable ground for prospecting.

Manitoba

R. C. McDonald will continue the work begun last year of making accurate control surveys for a general geographical and geological map of northern Manitoba. A good geological map is needed by prospectors and explorers in the region in addition to the various detail maps of mineralized areas which have been prepared by F. J. Alcock and E. L. Bruce. The Air Board of Canada is expected to assist in this work by carrying supplies during the summer, making observation flights and taking photographs from the air.

F. J. Wright will continue the systematic geological mapping on a scale of one inch to the mile of the Rice Lake mineral area east of Lake Winnipeg, which he commenced last year. The area contains deposits of gold and copper-nickel ores whose relations to certain granite and gabbro intrusive rocks have already been fairly well established. Dr. Wright is now preparing maps of the district that will show the distribution of these formations which are of such significance to prospectors.

Ontario

E. E. Freeland will complete the topographic mapping on one inch to the mile of an area of over 200 square miles around Port Arthur and Fort William. A topographic map should fill many engineering and other requirements in this important and rapidly developing industrial centre. Mr. Freeland will also make accurate control sur-

veys for a series of standard one mile maps between Port Arthur and Nipigon.

T. L. Tanton will make a detailed geological survey and investigation of the mineral resources in the area around Port Arthur and Fort William that is being topographically mapped by Mr. Freeland. Particular attention will be given to the clays, shales and other structural materials which are becoming of increasing importance to the two cities.

E. Thomson will commence the systematic geological and geographical mapping and investigation of the mineral bearing possibilities of an area just north of Woman River, on the main line of the Canadian Pacific railway. The area comprises part of a large "Keewatin" area in which iron formations and gold-bearing veins have been found and which appears to deserve the attention of prospectors.

The Huronian formations that extend along the north shore of Lake Huron from Sault Ste. Marie to Sudbury are of considerable economic interest since they contain occurrences of copper, gold and iron ores and inexhaustible supplies of high-silica quartzite. A thorough knowledge of the stratigraphy of these formations is also of fundamental importance to geological investigation in northern Ontario. Attention has been given to the investigation and mapping of this Huronian region by the Geological Survey since 1914, and will be continued this year.

R. C. Emmons will investigate and map in detail an area lying east of Echo lake and north of Bruce Mines and Thessalon.

G. W. Bain will do similar work in another area just north of Webbwood. This area includes a body of considerable size of basic igneous rock similar to the nickel-bearing intrusive of Sudbury district.

T. T. Quirke will commence the detailed geological mapping on one inch to the mile of an area of over 400 square miles north and east of Killarney. The area is of importance in the study of Precambrian geology because it occupies part of a little known gap between the Huronian region of lake Huron and the Grenville region of eastern Ontario. Owing to its location on Georgian bay and the cheap transportation facilities to Canadian and United States ports afforded by the Great Lakes, low-priced mineral materials, such as feldspar, high-silica quartzite, granite and other building materials, which occur or may occur in the map-area, have greater possibilities of development than deposits situated less favorably. Special attention is therefore being given by Dr. Quirke to occurrences of this character.

S. C. McLearn will make a triangulation survey of the area which is being mapped by Dr. Quirke for the purpose of establishing accurately located points throughout the area to which the less precise surveys of the lakes, streams and other features will be tied and controlled. This will increase the accuracy of the map and give it permanent value as a contribution to the primary mapping of Canada. The triangulation survey will be connected with stations in Sudbury area and with a detailed resurvey of the coast and islands of Georgian bay made in 1915-1918 by the Ontario Government.

E. M. Kindle will study the succession and age relationships of the Palaeozoic formations of northern Ontario on the Kabinakagami, Albany and lower Abitibi rivers.

M. E. Wilson will continue the systematic geological mapping of the Precambrian formations in the vicinity of Madoc. Examination will be made of the gold-arsenic deposits at Deloro, the pyrite deposit at Sulphide and other mineral occurrences.

E. V. Ellsworth will continue the study of the radioactive minerals of Ontario and Quebec. He will also continue a systematic investigation of Canadian occurrences of the minerals of the rare elements, cerium, beryllium, zirconium, etc. New uses for these elements and their compounds are being found and there is an increasing demand for information regarding the sources of supply.

Quebec

During the development of the Porcupine, Kirkland Lake, Matachewan and other gold-bearing areas in northeastern Ontario, since 1910, it has become fairly well established that the gold deposits are related to small bodies of granitic rocks intrusive in the "Keewatin" schists. These schists extend eastward into Quebec and appear to be invaded by granitic rocks as in Ontario. Last year the Geological Survey commenced detailed mapping of part of the Keewatin area in Quebec immediately adjacent to the Ontario boundary with a view to mapping as many as possible of the granitic intrusives, and distinguishing drift-covered parts from parts where bedrock is exposed, and thus facilitating prospecting operations. Either by coincidence or in consequence of this action vigorous prospecting commenced in the area selected for mapping and before winter several discoveries were reported.

The commercial value of these discoveries has not yet been ascertained but this year there are indications of still greater prospecting activity. To satisfy the requirement for geological maps and information four Geological Survey parties will be placed in the district.

H. C. Cooke will make a detailed examination of all known occurrences of gold in the new district with a view to determining their extent and character, their geological relationships and the factors governing their origin and distribution. If time permits a comparison will be made with some of the Ontario deposits.

W. F. James and *R. Harvie* will each continue systemmatic geologial mapping of the country eastward from that which was surveyed last year, maps of which are now available.

R. Bartlett will make accurate instrumental surveys of the principal lakes and streams in the area to be examined by Drs. Cooke, Harvie and James. An insufficient amount of exact control surveys existed last year to enable satisfactory geological maps to be compiled, but this lack is rapidly being satisfied by the Department of Lands of Quebec, which is having surveys made of the townships boundaries and waterways. This survey work is being supplemented by Mr. Bartlett.

E. Antevs will study the stratified clay deposits of Quebec and Ontario which were formed during the northward retreat of the great ice sheets that covered Canada during the Ice Age, for the purpose of measuring in years the time which has elapsed since the ice sheets commenced their retreat. An ingenious method of age determination was developed in Sweden by Baron Gerard de Geer whereby the period of ice retreat in Europe has already been computed. An effort is now being made to make a similar determination for North America so as to add to our knowledge of the Ice Age in the northern hemisphere. Dr. Antevs, a pupil of Baron de Geer has spent the past two years studying the problem in United States and has carried his investigation northward to the Canadian boundary. This year, with some assistance from the Geological Survey the work is being continued in Canada and an opportunity afforded to learn the special methods employed.

F. A. Kerr will commence the detailed geological mapping of an area east of Lake Memphramagog and will investigate the mineral bearing possibilities of the area.

K. G. Chipman will complete the topographical mapping on a scale of one mile to the inch of an area of about 200 square miles around the Federal Zinc and Lead Mine, in

Gaspé. Mr. Chipman will also continue standard topographical mapping in the asbestos bearing region of southern Quebec.

F. J. Alcock will map the geological formations and investigate the mineral possibilities of the area in Gaspé which is being topographically mapped by Mr. Chipman. He will also examine various reported occurrences of copper and other minerals in Gaspé adjacent to the map-area.

J. D. Dart with the assistance of Professor Charles Schuchert, of Yale University, will study the succession of stratified formations on the south coast of Gaspé between Port Daniel and Newport. This work is contributory to the general understanding and correlation of geological knowledge of the Palaeozoic formations of eastern Canada.

J. B. Mawsley will map an area of anorthosite (a variety of intrusive igneous rock) north of Baie St. Paul and examine in detail the deposits of titanium ores which are associated with this intrusive mass.

A. T. McKinnon will collect in various parts of Quebec and Ontario specimens of ores, minerals and rocks for exhibit in the Victoria Memorial Museum at Ottawa and for preparation of educational collections which are distributed to schools, local museums, prospectors' associations and other institutions in Canada.

New Brunswick

W. S. Dyer will map on one mile to the inch the Minto coal basin, and will investigate in detail the structure and succession of the Coal measures, the coal seams, and coal reserves. This is contributory to a systematic investigation of the coal resources of Canada.

A. Anrep will survey and estimate the contents and commercial value of 4 peat bogs near Fredericton, Chatham, Shippigan and McAdam Junction. This is in continuation of a systematic survey of the peat resources of Canada.

Nova Scotia

E. R. Faribault will continue the systematic geological and geographical mapping of Nova Scotia on the scale of one mile to the inch. This work has now been carried westward as far as Middleton. During the present year Dr. Faribault will complete the Middleton and Paradise sheets and commence the Annapolis Royal sheet. He will also complete a detailed examination of the Nictaux-Torbrook iron range.

S. C. McLean will establish a series of precise triangulation points in the three areas which are being mapped by Dr. Faribault. This system of fixed points will be connected with the primary triangulation stations of the Geodetic Survey of Canada and will furnish an accurate control and give permanent value to the surveys of roads, lakes, streams and other features that are being made by Dr. Faribault.

W. A. Bell will complete the detailed geological investigation, begun last year, of the structure and stratigraphic succession in the Pictou coal area, near New Glasgow. He will also continue his work of correlating the coal seams of the Sydney coal area.

A. G. Haultain will commence the survey of a topographic map of the Springhill coal area on a scale of one mile to an inch. He will also make surveys for a detailed map on an engineering scale of the area in which mining operations are being carried on. These maps are required as base-maps for geological work which will follow, and the detailed map should also be of service in the conduct of mining operations.

M. E. Hurst will make a systematic study of the arsenic deposits in Nova Scotia, Ontario and other parts of eastern Canada. There is an increasing consumption of arsenic and a corresponding demand for an inventory of the available supplies of arsenical ores in Canada.

POSITION OPEN IN DEPARTMENT OF MINES

The following position is open in the office of the Deputy Minister of Mines, Ottawa. It is a desirable position for a man with a scientific bent and training as the appointee, if the right man, is in line for promotion to Head Clerk at a stated salary of $2,400-$2,880.

5641. — Principal Clerk (Male) for the Administrative Branch of the Department of Mines, at an initial salary of $1,800 per annum, to be increased at the rate of $120 annually to maximum of $2,280, this salary to be supplemented by whatever bonus may be provided by law. The qualifications required include education at least equivalent to high school graduation, and preferably university training in scientific subjects, with one year of experience in connection with the mining, metallurgical or chemical industries or related governmental work.

Applications must be in the hands of the Secretary of the Civil Service Commission, Ottawa, not later than July 26th. Forms may be had from the Secretary, or from the postmasters in the principal cities, or from offices of the Employment Service of Canada.

SASKATCHEWAN HAS RAW MATERIALS FOR MAKING FIRE-BRICK, TILE AND POTTERY*

The province of Saskatchewan is the fortunate possessor of extensive deposits of clays which may be looked upon as important raw materials. These will aid in the industrial development of the Prairie Provinces and should prove to be of great value. There are clays suitable for the manufacture of good building brick, structural and agricultural tile and sewer pipe; ball clays and stoneware clays for the manufacture of pottery, and also refractory clays for fire-brick.

During the past twelve years, the clays of Saskatchewan have been under investigation by the Dominion Department of Mines. Attention was first directed to the high-grade clays of the province by Mr. Joseph Keele in the report on his investigation of the clays and shales of the western provinces. A more detailed study of the clays of southern Saskatchewan was made later by Mr. N. B. Davis.

Under the auspices of the Provincial Government, the University of Saskatchewan has recently established a ceramic department, with Professor W. G. Worcester in charge, for the purpose of carrying on extensive tests on the clays of the province and to provide a course in ceramic engineering which is designed to fit men to supervise modern clay industries.

Interest has lately been aroused in regard to fire-bricks. Prof. Worchester has supplied bricks for tests in a locomotive of the Canadian Pacific railway. These will be submitted to a rigid endurance test, and examined at the end of each run. He states that, if they stand the test, they may displace millions of dollars' worth of imported bricks, but he reserves definite prophecies until the final results are known.

* Prepared under the Direction of Dr. Charles Camsell, Deputy Minister of Mines, by Dr. A. W. G. Wilson, Chief Engineer, Mineral Resources Division, for "Natural Resources."

A copper smelter to treat 6,000 tons of ore a month is in course of erection in Papua at Bootless Inlet by the New Guinea Copper Mines, Ltd. The ore contains 4.6% copper and $2.50 per ton in gold.

BOOK REVIEW

THE ORE MAGMAS, A Series of Essays on Ore Deposition, by Josiah Edward Spurr — McGraw-Hill Book Company, 370 Seventh Ave., New York—two volumes, 915 pages.

In the discussion and explanation of ore deposits the theory of magmatic segregation has of late years been used less and less, its place having been taken by the idea of concentration from surrounding rocks or from deeper-seated parts of the magma, the concentrating agent being water. A classical example of the change in the trend of opinion is the copper-nickel ores of the Sudbury region. The earlier reports on these well-known ore-deposits seemed to leave no doubt as to their origin. They were described as segregations from the great norite laccolith. But, as time went on, evidence accumulated that the process had not been quite so simple, and the tendency of late has been to attach more importance to concentration by circulating waters and less to magmatic segregation.

In a two-volume book that gives the conclusions reached after a life-time of field experience, Mr. J. E. Spurr now brings us back to magmatic segregation as the principal method of ore-deposition. The title of the book, *The Ore Magmas,* leaves no doubt. The author finds little if any evidence of the concentrating action of circulating waters. The conclusions he reaches, based as they are upon his own unusually extensive observation, will be received with respect. The argument will impress, if it does not always convince. "So far as I have seen," a phrase frequently used in this book, is an expression of the caution and the modesty of the author. "These observations and conclusions, then, represent the gist of thirty years' study of ore deposits, mainly in the field" (Foreword, p. v.).

The author begins by pointing out that a series of dikes in Forty Mile Canyon, Alaska, of the same age, show a gradation from dark rocks composed mostly of hornblende, through hornblende granite, to quartz-feldspar dikes, and finally quartz dikes, in some of which he found gold. This is a case of *magmatic differentiation.* "The seasoned field geologist knows it to be a fact that igneous magmas segregate into unlike portions, which crystallize into rocks differing considerably in mineralogical and chemical composition." (p. 63). So far the author has plenty of company, but he applies this idea of magmatic differentiation to explain quartz veins, considering them as having been filled in at a later stage than the dikes but by the same process, not by circulating magmatic waters, but as it were at one blow by the solidification of a magma kept in the liquid condition to this late stage by the considerable proportion of water present. "The discovery of free gold in certain quartz veins of this type showed to me that not only the quartz veins but the gold-bearing quartz veins were the result of magmatic differentiation; and, finally, the association of gold and quartz in quartz veins became clear to me for the first time," (p .64)—a happy conclusion, for in an earlier paragraph the author states, "any explanation of ore deposition must explain the close association, in veins, of quartz and gold (and other metals) to be even an acceptable working hypothesis" (p. 61). The gold was present in the original magma, accompanied the quartz in the process of differentiation, and was deposited along with it when the whole mass became solid. One striking argument for this theory of vein formation is the presence in veins of angular fragments of the wall rock totally unsupported by the walls, indicating a viscous condition of the vein matter at the time the fragments broke off or a solution heavy enough to support them. It is hard to account for the position of these fragments, if the veins were filled by the deposition of quartz from circulating solutions.

In brief, the author's theory is that veins are filled directly with differentiated magma, and that exceptionally the magma contains enough gold to make the vein auriferous. The same origin with differences in details is put forward for other ore deposits.

Igneous intrusions are due to the pressure exerted by the magma, telluric pressure, associated by the author with gas pressure due to the presence of water and other gases. The magma thrusts itself powerfully into the rocks, causing folding and other disturbances. Fracture and faulting are to be explained by this same force. The flow of rock under the uplifting pressure of the intruding magma can be seen in some cases to have been vertically upward as well as horizontal. There is no evidence that open cracks have been filled with vein matter, but ample proof that the magma forced its way into the rock, cracking it and pressing it apart. This idea had already been used in explaining dikes, laccoliths, etc. The author now applies it to vein formation.

Ore magmas are special cases of magma in general There are subcrustal tracts rich in the various metals. A mass of magma moving over one of these picks up more or less of it. It intruded itself into the overlying rocks, and a differentiated part into which the valuable material has been concentrated forms the veins. Ore bodies having no obvious connection with intrusive rocks may still come under this theory. "The usual lack of igneous rocks in connection with the lead-zinc deposits of the Mississippi Valley and elsewhere in the world is not a proof that they are of non-magmatic origin." The punching up of the limestone into domes may be taken as evidence of the action of a hidden intrusive mass.

In discussing metallogenetic epochs the author points out that they were brief periods of ore deposition separated by great stretches of geologic time, during which erosion and sedimentation went on, but no ore deposition. This disposes of the theory of general ore depositions by circulating waters of surface origin, and also of the theory that minerals are collected by such waters from rocks through which they are disseminated. (p. 386). Ore deposition periods are coincident with times of widespread igneous intrusion, and therefore are also separated by great periods of geologic time, and similarly rock deformation (p. 387).

The fascinating story of North America as read from the rocks is told on page 392 and the following pages. In the Colorado region, for example, there was a succession of quiet sinkings and risings with erosion and sedimentation, till late Cretaceous times, when a final rise was the prelude to geological revolution and a period of ore deposition. Such catastrophes were due, according to the author, to migration on a vast scale of the sub-oceanic magma (pressed out by the accumulating weight of sediments?) to the continent, there to be thrust upward by the impelling force behind.

These two volumes, written in a simple, familiar style, without undue indulgence in technical terms, are the interesting record of a long life of close and intelligent observation in the field. They are not so much the elaboration of a theory as the description and correlation of facts, for the observation of which the author had unique opportunities. He brings forward the theory of magmatic segregation or differentation in a new way, and in his own words, (p. 507) "*Exit,* then, and *vale,* so far as I am concerned, the underground, surface-derived water below the superficial rock zone as a cause of the primary concentration of ore deposits."

SELF-DEPENDENCE IN FUEL NEEDS

"Natural Ressources," an official publication of the Department of the Interior, Ottawa, publishes in its July issue the following summary of the recent interim report of the Dominion Fuel Board. This official resumé follows:

The Dominion Fuel Board, which was organized last winter under the chairmanship of Dr. Charles Camsell, Deputy Minister of Mines, has issued a report which is of great importance in emphasizing as it does the rapidly approaching necessity of self-dependence in the matter of fuel resource. Canada has computed coal reserves of 1,234,269 million metric tons against a present consumption of about 32 million tons annually, but this is unfortunately concentrated in the western and eastern extremities, leaving the populous industrial sections of Ontario and Quebec dependent so far on other sources of supply.

To remedy this state of affairs, the Board stresses th greater use of Maritime and Western coals, the importation of Welsh anthracite, the coking of bituminous coal for domestic purposes, the establishment of central heating plants, and the more extended use of peat and wood as auxiliary fuels.

Maritime and Western Coals. — While the coal of the Maritime Provinces is bituminous and therefore as a domestic fuel is subject to the same prejudice as United States bituminous, the Board believes that this coal should be used in the making of a domestic coke and would thus materially assist in the solution of the domestic fuel problem. Alberta coal ranges from lignite to semi-anthracite, and has during the last few years successfully competed with American anthracite in Manitoba. Trial shipments have also been made to Ontario. The crucial problem here is that of transportation costs.

Coking Bituminous Coal for Domestic Heating. — The Board is making a thorough investigation as to the feasibility of establishing by-product recovery coking plants at such points as Montreal and Toronto for local consumption and for shipment to tributary territory. The abundant bituminous resources of Nova Scotia, New Brunswick, and the United States would be used for this purpose. Recent improvements make domestic coke much superior to ordinary gas-house coke and of approximately the same heating value as anthracite. This coke has practically displaced anthracite at a number of points in the United States, including St. Paul and Minneapolis from which points shipments are being made to Winnipeg.

Central Heating Plants. — These, it is calculated by the Board, would reduced the cost of heating by allowing the use of low-grade fuel; the delivery at one central point; by the disposal of ashes and the use of trained engineers. Such plants are in use in the United States, in Europe and in various parts of Canada, the best known here being the plant in Ottawa which heats the Parliamentary and other Government buildings.

Welsh Anthracite. — This is of higher grade than Pennsylvania anthracite, but breaks up more in transit. The best varieties contain about 90 per cent. carbon and 3 per cent. ash. Welsh firms are now canvassing the situation.

Peat. — The Board is of the opinion that peat could be used to advantage in the fall and spring months and, if the results already accomplished experimentally are not sufficient to induce private capital to engage in the industry, further encouragement should be given by the governments concerned.

Wood. — It is stated that the wood resources of Canada could be utilized to a greater degree in supplying a portion of our fuel needs.

The report concludes by warning the public of the false sense of security engendered by an easing in the anthracite market and urges the need of educating our people away from dependence on a single source of supply.

LONG LIFE PREDICTED FOR GOLD MINES

Preparatory to issuing the new securities of Northern Canada Power recently, the Dominion Securities Corporation, which bought the issue, made inquiry of Mr. J. B. Tyrrell as to the status of the northern gold-field. Following is his letter, which is a striking profession of faith in the gold mines of Northern Ontario:

"Northern Ontario has now attained a permanent position as one of the great gold mining countries of the world. Large areas of it are known to be underlain by gold-bearing pre-Cambrian rocks in which a few rich producing mines, namely, the Hollinger, McIntyre, Dome, Wright-Hargreaves and Lake Shore, etc., have been opened up, while others now in process of development will soon be added to the list of producers. The ore in these mines will doubtless be found to extend downwards as far as favourable country rock continues, with no certain prohibitive mining limit but that made by the heat of the interior of the earth.

"As examples of deep gold mines in pre-Cambrian rocks in other parts of the world, may be cited: The Morro-Velho Mine in Brazil, owned by the St. John del Rey Mining Company, which has been working for more than one hundred years, is now 6,726 feet deep and is still in very rich ore; the group of mines on the Kolar Gold Field in Mysore, India, which have been working for forty years, have produced gold to the value of nearly $300,000,000 and are now working at a depth of 6,000 feet; the group of mines at Kalgourlie, West Australia, which have been operating for thirty years, have produced gold to the value of about $350,000,000, and are working at a depth of about 4,000 feet; the Homestake Mine in South Dakota which has been operating for forty-five years, has produced gold to the value of about $170,000,000, and is working at a depth of 2,000 feet without any diminution in the quantity or grade of the ore. Therefore, considering that these great gold mines or groups of mines have been operating for many years in pre-Cambrian rocks very similar to those of Northern Ontario, that they have all reached great depths, and that their ore is continuing downwards, we may confidently rely on the permanence of our Ontario gold mines which are also in Pre-Cambrian rocks, and which, down to the depths to which they have yet been worked, are following closely the laws applicable to the other mines mentioned above.

"The Ontario gold mines which are producing, were all discovered by natural outcrops of ore-bearing veins. Vast areas where such outcrops may also occur have not yet been examined by prospectors and their possibilities are still unknown, and besides such "rocky" areas, all travellers in Northern Ontario will agree with me that 90% or more of the pre-Cambrian rocks are covered with a thick overburden of soil or detritus which completely hides them and renders casual discoveries of ore quite impossible; nevertheless these rocks so covered and hidden from view may contain just as many mineral deposits per square mile as those which are exposed on the bare rocky hills and ridges.

"The mines which have already been discovered will doubtless be working for generations. In addition to these, considering the great extent of the covered and unpros

pected areas of pre-Cambrian rocks relative to the prospected areas, and the possibilities of these covered and unprospected areas for containing ore, I am quite confident that many more rich mines will yet be discovered and that Northern Ontario may be depended upon as a great mining country for centuries to come."

SOUTH AFRICAN CAPITAL IN KATANGA MINES

Mr. Robert Williams, who has been intimately associated with the development of the Rand goldfields under the leadership of Cecil Rhode, is now one of the principals in the development of the Katanga mineral deposits, in association with M. Jean Jadot, President of the Union Minière Company. He and his associates have put millions of pounds into the Katanga enterprises, having built railroads and towns as well as constructing smelters and developing mines. An account of his recent visit to Elisabethville in the mining region of the Congo is given in the *South African Engineering and Mining Journal*. In addressing the guests at a banquet held in his honour, Mr. Williams said, in part:

"When I last visited Elisabethville, it was to inaugurate the smelting operations. When the molten stream began to flow I turned to a companion and remarked, 'This is the beginning of the stream that is to completely revolutionize Central Africa.' To grasp the meaning of this industry and its future the factors which have been the cause of success so far and which will make for greater success in the future, one must look back as well as forward. One must bring one's experience gained in the other industries further south. This is the fourth mining industry in Africa I have grown up with, and I venture to say that this one will be the greatest of them all; but only if the experience gained at the other three is profited by. What was that experience?

"First, that a great industry can only be made a success by encouraging every adjoining country as well as your own country, to develop everything your industry may require, whether it is a railway, a coal mine, a sulphur mine, beef or food of any sort. You will require them all as your own country, with its rapidly developing industries, will never be able to supply the needs of this great industry as I picture it in the future. Indeed, this industry would not be so far advanced as it is to-day had not Rhodes pushed on his Cape to Cairo railway, and Wankie Mines, from which your coke comes, would not be in existence to-day for the same reason.

"Secondly, you will require to encourage from now onwards all natives from your own country and from surrounding countries and to gradually acclimatize them to this country as the industry grows in order to have the 60,000 or 100,000 natives this industry will ultimately require. You will never be able to depend on any one source of native labour. Most of your sources of native labour will be required for the rapid development of railways and other industries in your own country. It is also quite certain this industry cannot depend on one railway as it does at present.

"Thirdly, the knowledge gained in the goldfields of their geological occurrence was necessary in order to guide my staff and myself to this country and its great copper belt. In fact, when Cecil Rhodes asked me to find mineral wealth to assist his Cape to Cairo railway north, I looked at the map of Africa and saw a great divide forming the headwaters of the Congo and Zambesi Rivers and realized that divide was really a du plication of the divide which forms the head-waters o the Limpopo and Orange Rivers further south an which constitutes today the Rand Goldfields.

"If it was a great effort to expose the mineral weal of these mines, situated as they are over 1,000 m. fr from any seaport or railway terminus, it was a st greater effort to develop work and finance th Railways had to be built, large installations had to b erected, villages created with water supplies over 25 miles of a continuous reef. Native labour had to b organized and hospitals for white and black staffs ha to be erected. Water power had to be investigate and great epidemics had to be fought. Millions had t be found for this purpose, and these millions wer found chiefly as the result of the efforts of my re pected colleague, Monsieur Jean Jadot, President o the Union Minière Company, and myself."

The copper ore was first discovered as isolated ou crops, which were afterwards found to be parts of continuous "reef", extending for a distance of 2 miles. "About ten miles out of 250 miles of this coppe belt has given a development of 50,000,000 tons of or containing about 4,000,000 tons of metallic copper. Many other deposits have been located, but awa development. Only high-grade ore is being used a present at the smelters, whose capacity is 50,000 ton of copper per annum. Mr. Williams predics that thi will be vastly increased as railway communication i improved.

RETURN FROM RAND INVESTMENTS

In a paper presented to the Chemical, Metallurgica and Mining Society of South Africa, R. A. Lehfeld gives further data explaining his calculations of th return to capital from the Rand gold mines. The aver age is, he estimates, 6.20 per cent. Twelve mines hav yielded more than double the investment; 30 have re turned more than the investment; 16 have yielded ov half the investment; 25 have yield under half th investment; and 12 mines have made no return at al The figures used for this calculation are official return from 1907 to 1921.

WATER POWER IN THE ACUTE FUEL AREA

The "Acute Fuel Area" has now narrowed itself dow to the provinces of Ontario and Quebec and it is of in terest to observe the effect of water power development relieving the situation in those provinces.

In Ontario the developed water power has increase from 430,000 h. p. in 1910 to 1,220,000 h. p. in 1922 184 per cent. and in Quebec from 315,000 to 970,000 215 per cent.

These coal-less provinces import from abroad over 9 per cent of their coal requirements, but in Ontario th coal equivalent of developed water power substantially ex ceeds the total coal consumption and in Quebec it is mor than twice the coal consumed. The total saving in coal a an average cost of $10 per ton is over $192,000,000 pe annum in these two provinces alone.—"Natural Resources

Oxygen gas produced by the method of liquefactio from the air costs from 75 cents to $1.00 per thousan cubic feet. When a method is devised of making it a a cost of 25 cents per thousand feet, it will be availab for many new and important industrial uses.

THE MINING DISTRICTS

By THE JOURNAL'S CORRESPONDENTS

NORTHWESTERN ONTARIO

The Schreiber gold area is attracting increasing attention as development work proceeds on the various properties now being opened up. Mining men from Porcupine and Kirkland Lake are not infrequent visitors, while mining engineers and investors from various parts of the United States are taking a keen interest in this field.

The Schreiber Gold Mines, Ltd., have taken up their option on the McKellar-Longworth property, and have made the first payment. They have been carrying on an active development campaign since March 1922. The work to date consists of extensive stripping and trenching, sinking, tunneling and cross-cutting, together with general surface improvements. The work so far done shows that the vein system consists of a series of parallel veins in a zone 400 feet wide, crossing the property from east to west. The underground work consists of No. 1 tunnel, which is now in 135 feet, cross-cutting the vein system, the objective being the north boundary of the mineralized zone. No. 2 tunnel is being driven 500 feet west of No. 1 on the same zone, and is now in 50 feet, exposing the same formation and veins as found in No. 1. An open cut has been made on the hillside above No. 2 tunnel, from which 15 tons of high-grade ore was taken, together with 5 tons fom No. 2 tunnel, and sent to the Timiskaming Testing Laboratories at Cobalt, the whole 20 tons giving an average value of $12.40 per ton. No. 3 shaft is 6′ x 8′ between timbers, and is now down 20 feet, midway between the two tunnels, on a vein paralleling No. 1. The latter is from 3 to 5 feet in width. The westerly extension of this vein, described as No. 2 is from 8 inches to 18 inches in width, carrying a higher grade of ore than No. 1. No. 4 shaft is 250 feet south, and midway between the tunnels, 6′ x 8′ between timbers, and is down 50 feet. Visible gold shows all the way down. 225 feet south of No. 4 shaft there occurs a vein of schist and quartz 16 feet wide, with well defined walls. This vein has been opened by trenches at various points and shows free gold wherever exposed. This latter is the largest and richest vein on the property.

A good road system has been provided, together with a complete set of camps to accommodate 30 miners, an office building, assay office, cottages for employees and stables.

A Diesel engine, with capacity for running 4 drills, pumps, and all power requirements has been installed.

The campaign of development as outlined and now under way will consist in pushing both tunnels until they cut all veins in the ore zone, and sinking to the 200-foot level, where lateral work will be commenced. The drift will give a back of 300 feet.

The work is being carried out under the direction of Charles Randall, recently of the Dome Mines, Porcupine.

The Tonapah Mining Company, who are also operating properties at Kirkland Lake, have secured mining claims A. L. 54, and R681, and are negotiating for a group of surrounding claims in the Schreiber field. These properties are about one mile north of the Schreiber Gold Mines' lands, and abut on the Canadian Pacific Railway, about one mile east of Schreiber. This company have a crew of men at work stripping and trenching preparatory to commencing underground development.

Louis Fenning, representing New York interests, controls 16 claims immediately east of the Tonapah group. He has put down a 7′ x 11′ shaft 110 feet, the objective being the 300-foot level. The shaft is being put down on a strongly defined, well mineralized veins carrying good gold values. Lateral work will not begin until the objective is reached. The property is equipped with a 4-drill compressor, steam hoist, and most complete camp equipment.

Rayton E. Horton, of Patterson, N. J., is carrying on surface work by way of stripping and trenching and general surface improvements preparatory to beginning underground development, on R608, R609 and R610, situated about one mile east of the Schreiber Gold Mines properties.

The Tonapah and Horton developments are under the direction of William Longworth, formerly of the McKellar-Longworth property.

BRITISH COLUMBIA

Electrical Power for Stewart — Water-power is being developed near the town of Stewart, gateway to the Portland Canal mining district, in order that a lighting and a telephone system may be provided for residents of the community. The project is being put through by the International Electric Co. Ltd. and it is understood that the funds needed are being found chiefly in England.

Trail Ore Receipts — Ore receipts at the Trail Smelter, Consolidated Mining & Smelting Co. of Canada, from the 15th to the 21st June totalled 6,129 tons, made up as follows:

Alamo, Alamo	45 tons
Company Mines	5592
Knob Hill, Republic Wn.	51
Lone Pine, Republic Wn.	171
Quilp, Republic Wn.	100
Ruth, Sandon	48
Silversmith, Sandon	79
Soho, Rambler	33
Silver Bear, Zwicky	10
	6,129

Whitewater Mine to be Worked by Owners — John R. Retallack, of the Whitewater Mines, near Kaslo, has announced that the mine is to be re-opened by the company and put on a producing basis. This is one of the Kootenay properties that has been worked recently by leasers. In regular operation it has a production record of 34,477 tons of lead ore shipped with a net value of $1,579,213, and 16,086 tons of zinc ore with a net value of $209,595. From this production a profit of $622,515 was derived. This record is a sample of the results obtained from the development of a Slocan ore-body. Thus far the ore has been taken from a small area of ground and it is anticipated that the mine has years of life ahead.

Shafts for Kootenay Property — The Rio Tinto mineral properties, situated in the Salmon River Valley, West Kootenay, are reported to have passed into the

hands of an American syndicate at a price of $60,000. The development done on two well defined veins has exposed them on seven claims. The values are chiefly in silver and lead with a small amount of gold. The new owners intend surveying the property and installing the machinery necessary to sink two shafts, which, it is calculated, will be put down 350 feet. This work done, the properly should be in shape for steady production.

Engineer Mine Action Dismissed — The latest action involving title to the Engineer Mine of Atlin has been dismissed with exceptional curtness. Robert E. Williams, of Milwaukee, and his brother Horace K. Williams, of Los Angeles, who sought a declaration that as relatives of the deceased they were entitled to one-third interest in the estate of the late James Alexander, have been informed that their action is "frivolous, vexatious and an abuse of the process of the court." The plaintiffs are brothers of Abie Alexander who was known as the wife of Capt. Alexander but proof of whose marriage has not yet been found notwithstanding diligent search throughout Canada and the United States. Thus, it would appear, another legal obstruction to the development of this British Columbia gold property is removed.

Babine Bonanza Tunnel — James Cronin, mine operator, has returned to superintend further development of the Babine Bonanza, a property near Telkwa said to have great promise. A long tunnel is being driven 1,000 feet and is being continued at a depth of 300-odd feet under the surface workings, to tap the ore-bodies.

Rambler-Cariboo Producing — The Rambler Cariboo Mine, Slocan district, again is being operated. Production on a small scale will be maintained while development will be energetically prosecuted.

Gypsum Quarry to Operate — The gypsum deposit of Salmon River, near Vernon, central British Columbia, is to be exploited, according to report, plans being well in hand to that end. A. W. Davis, resident mining engineer, in last year's report said that this would appear to be the premier gypsum deposit of the province's interior. There is a very large tonnage in sight. The Manitoba Gypsum Company are the owners and it has been their intention to furnish all the western demand for the material. Owing to delay in projected railway construction, the property has been standing idle, although developed and equipped and ready to ship on short notice. The material is a pure white gypsum (alabaster) in rock form. A typical analysis follows:

CaO	32.60 %
SO_3	46.87
H_2O	20.80
Insoluble	0.06
	100.33

Certificates for Coal Mine Officials — Examinations for the granting of First, Second and Third Class and Mine Surveyor's Certificates of Competency were held, under the provisions of the British Columbia Coal Mines Regulation Act, on the 29th 30th and 31st days of May, 1923 at Nanaimo, Fernie Merritt and Cumberland. The Board of Examiners has recommended that Certificates be granted to the following candidates who have obtained the necessary number of marks:

Second Class: Edward Morrison, Fernie; Daniel Morgan, Nanaimo; James Duncan, Fernie.

Third Class: Albert Bastian, Ladysmith; Henry C. Beard, Natal; William M. Frew, Nanaimo; John Chapman, Ladysmith; John B. MacLaren, Michel; Peter Hindmarch, Lantzville; William Gregory, Natal; J. J. Eccleston, Coal Creek; John Smellie, Michel; James Rallison, Nanaimo; John Pollock, Ladysmith.

Mine Surveyors: James S. Crosscombe, Coal Creek; Joseph Sandland, Nanaimo.

NOVA SCOTIA

The Steel Strike. — The labor situation in Cape Breton is now completely disarranged, and before matters settle down labor will find itself with a very humble and contrite heart. Already much of its vanity has evaporated and the swelled heads so noticeable during recent months have contracted at least to normal proportions. The last act of the drama is being staged with the British Empire Steel Corporation in a mood to cry, "Lay on, McDuff, and damned be he who first cries 'Hold.'" The curtain will fall, and when the confusion and the noise of oratory have cleared away there will be more wise men in Cape Breton than there have been for many a day. Already there are not a few disillusioned steel workers around Sydney, whose hopes are as water spilled on the ground. The one hundred per cent. strike so loudly proclaimed and long threatened has failed to materialize, and the joy of battle lasted only one short day. Eight hundred men refused the call to quit work at the steel plant, and when the strikers in their despair attempted to raid the plant and rush these men from their work, they were met with an opposition just as determined and more courageous than the mood any striker showed, for they themselves were driven by the remaining employees from the plant. The Sydney steel strike was broken the first day it began, and the desperation shown by the strikers proved that they fully realized their hopeless position. Mob violence played into the hands of the company, and lost the workmen the little sympathy that had been felt for their cause. Raids and rioting were answered by the bringing in of soldiers and provincial police. When these latter, after having been stoned and insulted, cleared the streets, the most horrible reports of brutality were put into circulation, and the collieries rang with stories of dead children and injured women. Strikers and civilians, it was stated, were all alike to the provincial police, and no one was safe on the streets of Sydney. The public circulation of these false reports has proved the undoing of the "red" leaders, Livingston and McLachlan, now in prison and awaiting trial in Halifax.

The Coal Strike. — The promise made by the miners' convention in New Glasgow a few weeks ago, to help the steel workers in case of a strike has been put promptly into effect. When the miners saw the Dominion Coal Co. taking the horses out of the mine they admitted they had made a mistake, but had not the courage to tell their leaders so. They may do this in another way. The men are not unanimous for a strike and have entered on the struggle with little heart and less hope of winning. The maintenance men, however, have in most case been withdrawn from the collieries. Many of these are filling up with water and gas. Secretary McLachlan is alleged to have stated to the Attorney-General of the province, when his attention was drawn to the damage that might occur through his action, that "the Company's property could go to hell". Although it is well known that the coal pile of 200,000 tons representing the work and wages of the

miners of the winter months is on fire, the district executive have likewise refused to give any aid in removing it. Indeed, it may be found that any attempt to ship this coal will meet with strong opposition from the pickets, and round this coal pile may rage a battle.

Small Poll in Wages Vote. — A vote in favour of the 1921 rates of wages taken by the miners on the second day of the strike showed less than half the vote of the membership polled. Some districts like Springhill, Pictou and New Waterford either did not vote at all or voted against the strike. The apathy of the general body of members showed that they are not in favour of violating the agreement, and had the voting taken place before the men came out on strike it would have showed a large majority against the strike. The rank and file today are asking one another why they are on strike and no one seems to be able to tell. District officers admit that their affairs are badly muddled and that they are unable to disentangle them and lead their followers onto firm ground. Each step only sinks them deeper and they seem to be awaiting someone to come to their relief. It may be that the International President may relieve one or two of the officers of their duties and ask others to fill their places. This solution is one that has long been talked of and is expected by a number of the locals.

Coal Strike is Directed Against Provincial Government. — Whatever may be said for the steel strike, nothing favorable can be said of the coal strike. The cause admits of no compromise as the strike is not against the coal company but against the provincial police, and the Province controls this body. Either the Province or the United Mine Workers must back down. Other classes of labor have just as much cause to agitate against the provincial police as the miners. If the police act wrongly, they must be held responsible by the Province and judged by them, not by any labor organization.

TREADWELL YUKON

The annual report of the Treadwell Yukon Company, issued on May 15th last, gives particulars of the Company's holdings in the Yukon and British Columbia. No. 1 shaft has been sunk to a depth of 300 feet, where a flow of water was encountered with which it was found impossible to cope. A 2,500-foot drainage tunnel is now being driven to intersect the vein at 500 feet in depth. No. 2 shaft, 400 feet south of No. 1, has been sunk to 100 feet. Between the two shafts shoots containing 40,000 tons of ore have been blocked out, with an average content of 93.4 ounces silver, 10 per cent lead, 12 per cent. zinc and 25 cents gold per ton. From this, 4,000 tons of high-grade ore of an average value of 230 ounces silver, 36 per cent. lead, 12 per cent. zinc and 60 cents gold per ton, has been bagged and shipped. The gross value of this ore is $175. a ton, and it is expected that the profit, after deducting freight, smelter and tariff charges, will be $100 per ton. It has been sent to the smelter at Bunker Hill, Idaho. A third and fourth shaft have been commenced, and are working in ore of average grade.

ALASKA COAL DISPLACES B. C. COAL

Coal mined in Alaska has been placed on the market, according to reports received from the Alaska mining station of the United States Bureau of Mines. It is now being retailed at Juneau, capital of the Territory, at a lower price than is asked for British Columbia coal. The coal being sold comes from the Suntrana field of Alaska. Further information is to the effect that the Suntrana coal is proving very satisfactory for household use.

IMPROVING THE EFFICIENCY OF THE BLAST-FURNACE

Through its investigations into (1) the reactions taking place at certain zones in the blast-furnace, (2) the effect and elimination of sulphur in coke, and (3) the use of oxygenated or enriched blast, the United States Bureau of Mines hopes to reach definite conclusions which will be of considerable benefit to the iron and steel industry.

At its Minneapolis experiment station the Bureau of Mines has conducted several smelting campaigns, these including the regular sampling and determination of gases at fixed planes in the blast-furnace, from which certain deductions can be made. Another run is under way during the present month. Trials are also being made with oxygenated blast.

The behavior and elimination of sulphur in coke is being studied at the bureau's Pittsburgh experiment station, this revealing some interesting facts regarding the absorption of sulphur by the iron sponge inside the furnace.

The possibilities of using oxygenated blast are many, and include (1) the elimination of hot stoves; (2) the use of an excess of coke to prevent chilling and freezing; (3) the elimination of sulphur; (4) allowance of the utilization of high-phosphorus ores; (5) improvement in Bessemerizing; and (6) lower cost. A committee of ten metallurgists, chemists, and engineers, including five Bureau of Mines men, is studying this phase, and will shortly issue a preliminary statement thereon.

DAVY SAFETY LAMPS UNSAFE

The Davy safety lamp, whose introduction into collieries in England over a century ago effected almost a revolution in coal mining, is now considered unsafe. In England it has been completely displaced by newer and safer types of safety lamps. A report of the United States Bureau of Mines (serial No. 2484) states that many are still in use in the United States and recommends that their use be discontinued as dangerous.

Papua and New Guinea, now under British control, are reported as rich in minerals. Gold and copper have been mined extensively, and osmiridium is now being obtained from placers.

Advertisements other than "Employment Wanted" or "Employees Wanted" will be inserted in this department at the rate of 20 cents per agate line (14 agate lines make one inch). $2.80 per inch, each insertion, payable in advance. Space measured from rule to rule. When four or more consecutive insertions of the same advertisement are ordered a discount of 25 per cent. will be allowed.

Advertisements of "Wanted Employment" or "Wanted Employees" will be inserted at the rate of two cents a word, net. Cash must accompany order. If box number is used, enclose ten cents extra for postage in forwarding replies. Minimum charge 50 cents.

FOR SALE

Gold property in Nova Scotia. Wide mineralized belt, 6 dwt. Recent shipment to Nova Scotia Technical College from seven-foot vein ran $18.00 per ton. Will sell, or will give interest to party willing to develop property and erect mill. Inspection invited. Particulars on request.

— PERCY WHITE, Stellarton, Nova Scotia.

Ontario's Minerals

PROVINCE OF ONTARIO

DEPARTMENT OF MINES

Hon. H. MILLS, Minister of Mines

Mineral Areas.

Ontario, with its 407,262 square miles, contains many millions of acres in which the geological formations are favorable for the occurrence of minerals, 70 per cent of the area being underlain by rocks of pre-Cambrian age. The phenomenally rich silver mines of Cobalt occur in these rocks; so also do the far-famed nickel-copper deposits of Sudbury, the gold of Porcupine and Kirkland Lake, and the iron ore of Magpie and Moose Mountain mines.

Economic Minerals.

In addition to the above, practically all economic minerals (coal and tin excepted) are found in Ontario:—actinolite, apatite, arsenic, asbestos, cobalt, corundum, feldspar, fluorspar, graphite, gypsum, iron pyrites, lead, mica, molybdenite, natural gas, palladium, petroleum, platinum, quartz, salt, talc and zinc. This Province has the largest deposits on the continent of talc, feldspar, mica and graphite.

Building materials, such as ornamental marble, limestone, sandstone, granite, trap, sand and gravel, lime, Portland cement, brick and tile, meet every demand.

Mineral Production.

Preliminary returns show the output of the mines and metallurgical works of the Province for the year 1921 to be worth $48,128,387, of which the metallic production was $27,574,202.

The following figures show the rapid growth of Ontario's mineral industry by five-year periods since 1891:

Year.	Value.	Year.	Value.
1891	$4,705,672	1906	$22,388,383
1896	5,235,003	1911	41,976,797
1901	11,831,086	1916	65,303,822

Dividends.

Dividends and bonuses paid to the end of 1921 amounted to $23,140,734 for gold mining companies, and $84,388,185 for silver mining companies or a total of $107,528,919.

Mining Regulations.

A miner's license costs $5.00 per annum, and entitles the holder to stake out in any or every mining division three claims of 40 acres each. After performing 200 days' assessment work on a claim, patent may be obtained from the Crown on payment of $2.50 or $3.00 per acre, depending on location in unsurveyed or surveyed territory.

Assay Office.

The Provincial Assay Office at No. 5 Queen's Park, Toronto, is maintained by the Department of Mines for the free identification of minerals, free assays under the provisions of the Mining Act of Ontario, and also for general assay work as per the Schedule of Charges which may be obtained on application.

Temiskaming Testing Laboratories

The Department maintains, at Cobalt, an ore sampling and testing laboratory which is now prepared to receive parcels of gold ore from 100 pounds upward, and after sampling and assaying the same to pay to the shipper the value thereof, less treatment charges. The purpose is to afford a market for ores extracted by prospectors and others in developing their mining claims, enabling them to obtain funds which they can use for further work and to report on the most satisfactory method of treatment. Fuller information may be obtained on application to the Manager, Temiskaming Testing Laboratories, Cobalt, Ontario.

Publications.

For list of publications, illustrated reports, geological maps and mining laws, apply to

THOS. W. GIBSON,
Deputy Minister of Mines.
TORONTO, CANADA.

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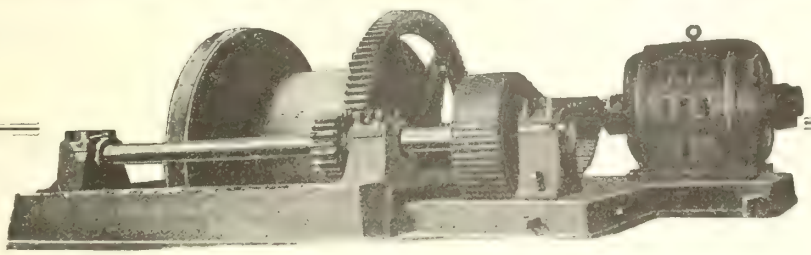

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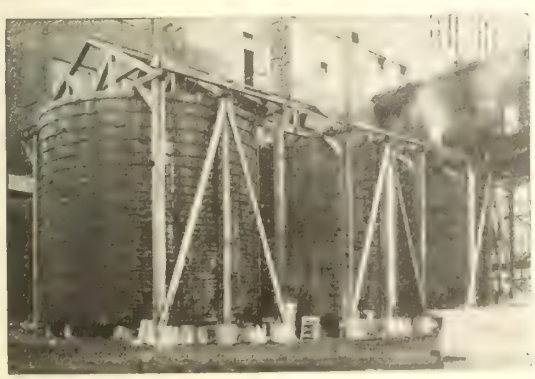

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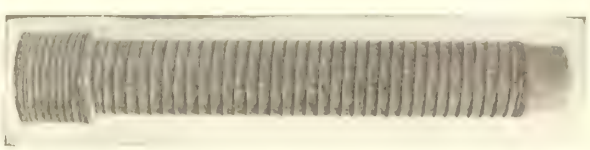

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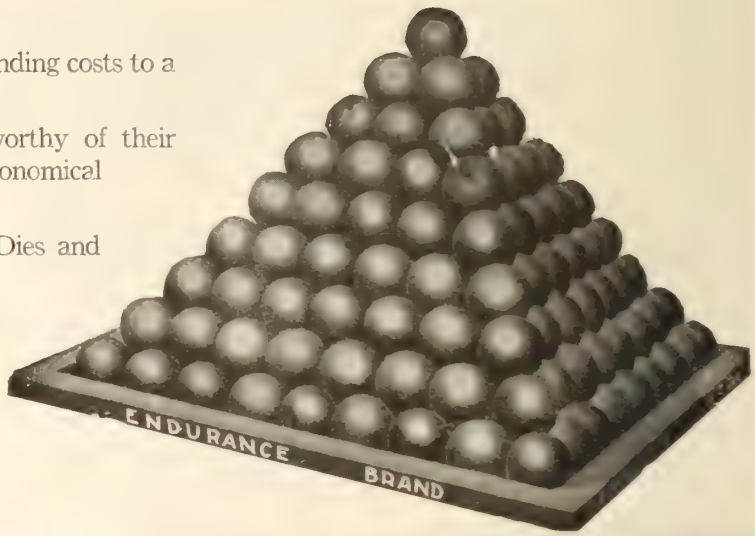

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WELLAND ONTARIO

BRITISH COLUMBIA

The Mineral Province of Western Canada

Has produced Minerals valued as follows Placer Gold, $76,542,203; Lode Gold, $109,647,661; Silver, $59,814,266; Lead, $51,810,891; Copper, $170,723,242; Zinc, $24,625,839; Coal and Coke, $238,289,565; Building Stone, Brick Cement, etc., $36,605,942; Miscellaneous Minerals, $1,358,839; Making its mineral production to the end of 1922 show an

Aggregate Value of $734,259,619

The substantial progress of the Mining Industry of this Province is strikingly exhibited in the following figures, which show the value of production for successive five-year periods: For all years to 1895, inclusive $94,547,241; for five years, 1896-1900, $57,605,967; for five years, 1901-1905, $96,509,968; for five years, 1906-1910, $125,534,474; for five years, 1911-1915, $142,072,603; for 5 years 1915-1920, $189,922,725; 1921, $28,066,641; for the year 1922, $35,158,843.

Production During last ten years, $339,280,940

Lode-mining has only been in progress for about twenty-five years, and not 20 per cent. of the Province has been even prospected; 300,000 square miles of unexplored mineral bearing land are open for prospecting.

The Mining Laws of this Province are more liberal and the fees lower than those of any other Province in the Dominion, or any Colony in the British Empire.

Mineral locations are granted to discoverers for nominal fees.

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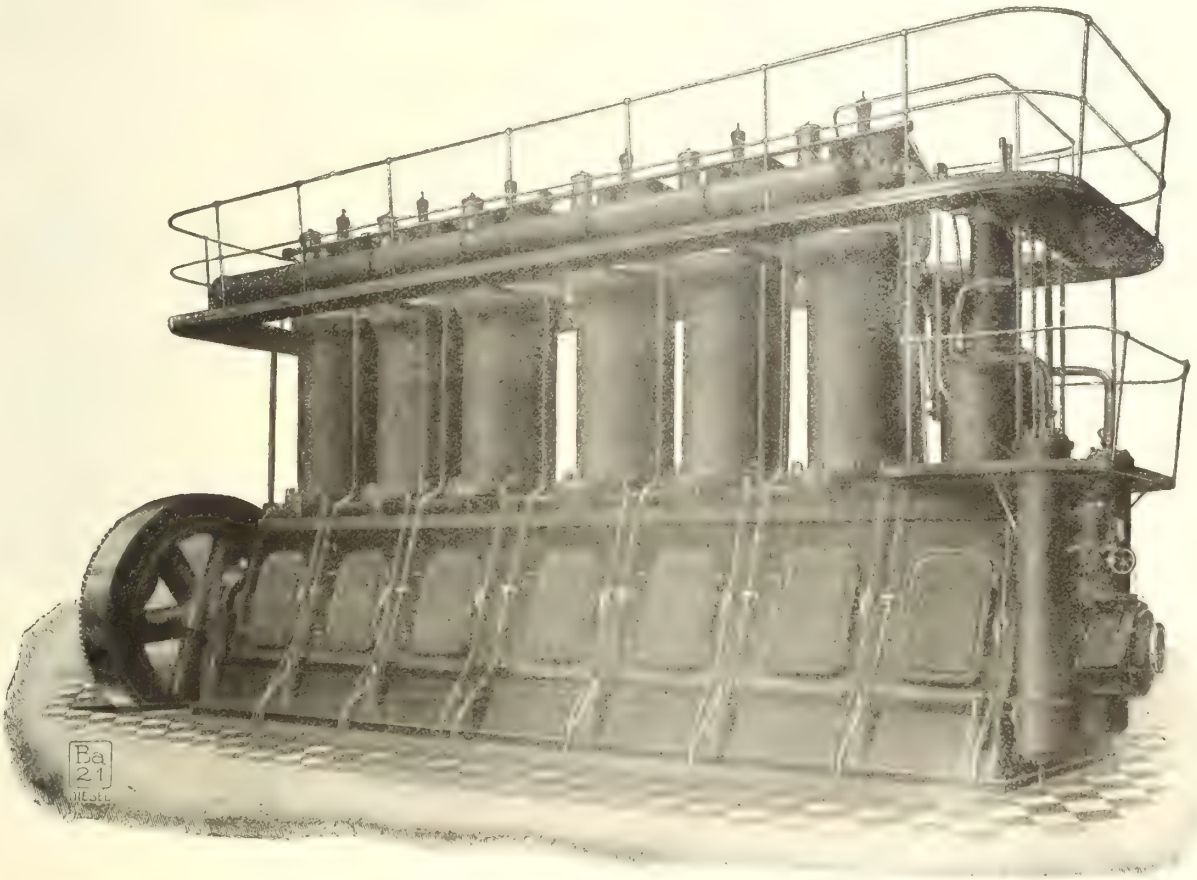

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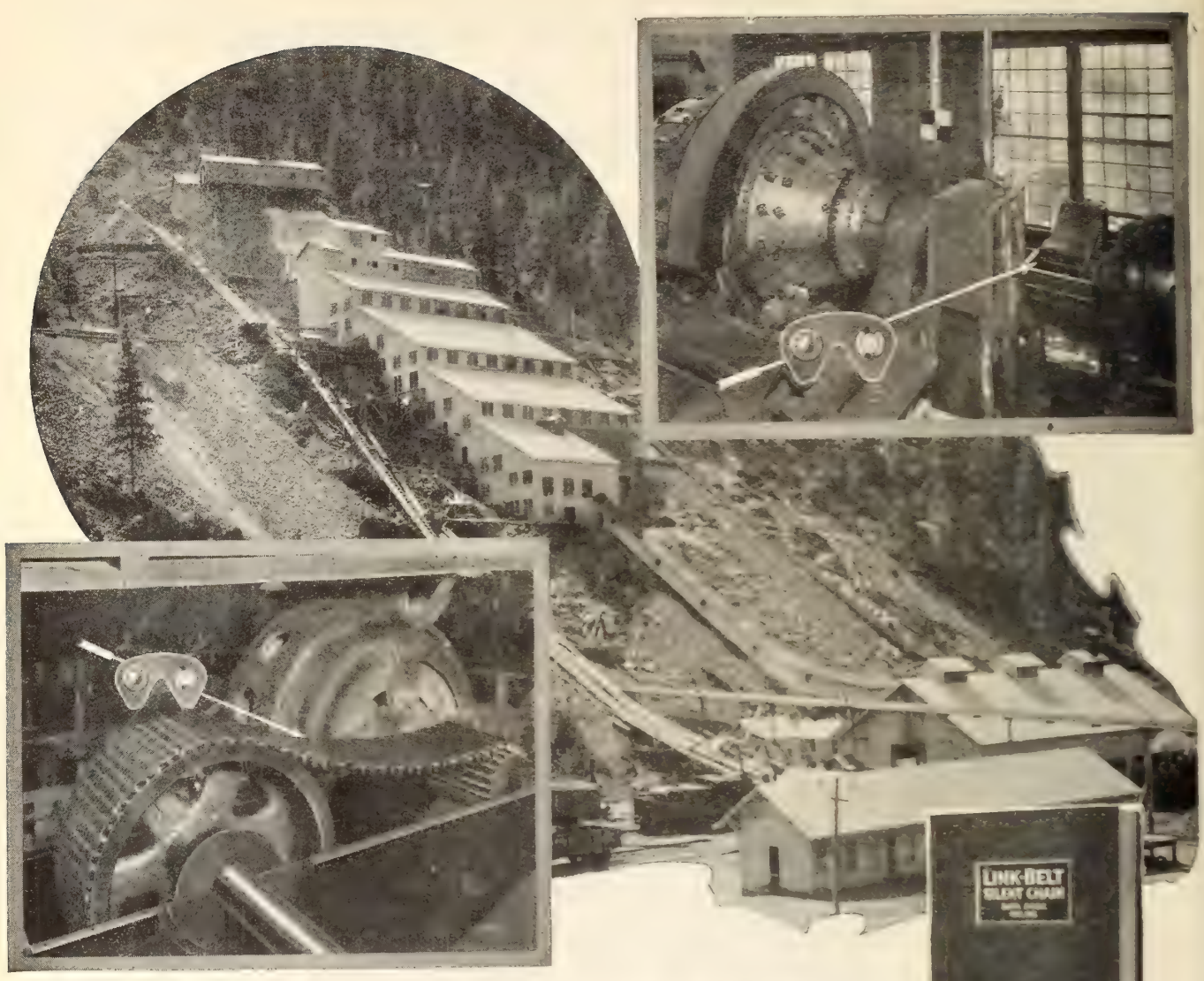

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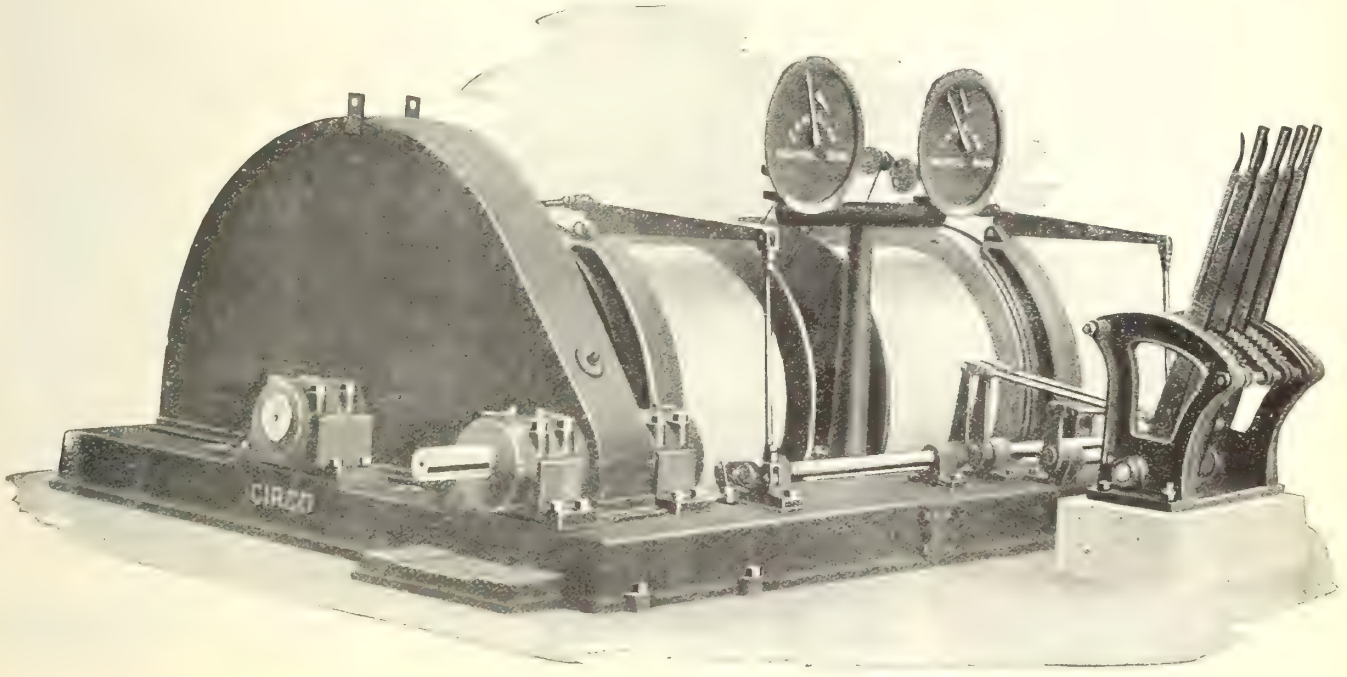

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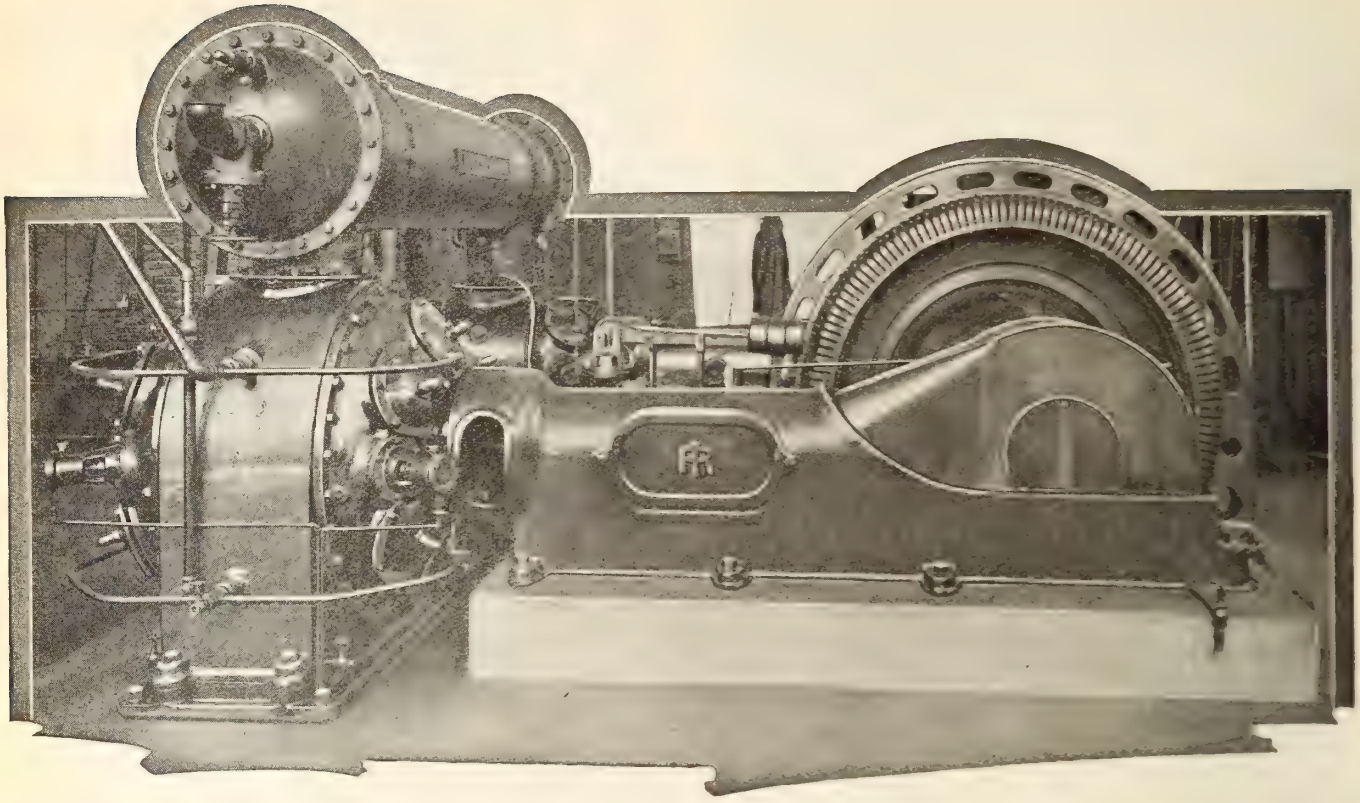

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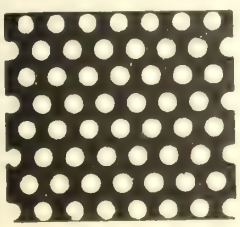

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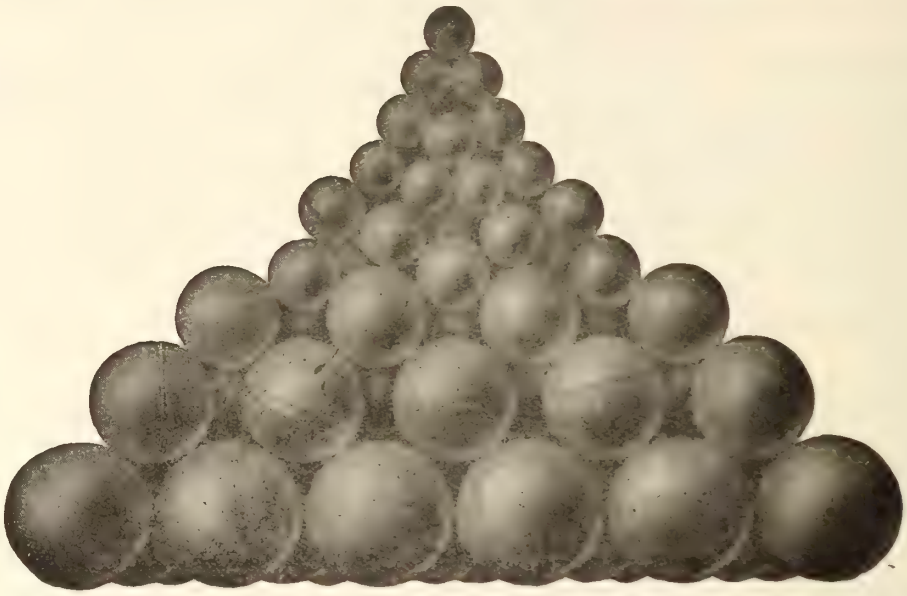

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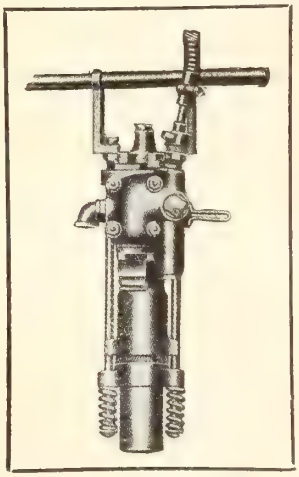

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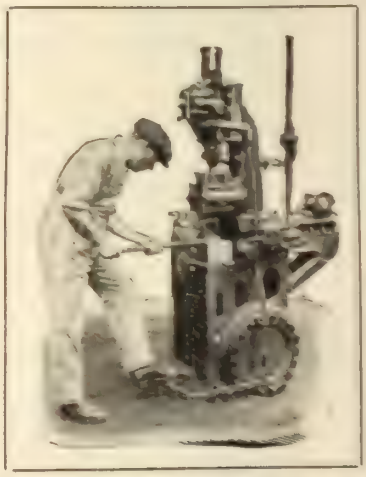

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:-: EDITORIAL :-:

REPORTS FROM THE ROUYN GOLD FIELD

Development of the Rouyn gold district of Northwestern Quebec has been slower than was anticipated before the prospecting season opened. First of all, the season was two weeks late. Then the fires began to run, and many prospectors remained on the navigable waterways or stayed out of the district altogether until the worst threat was past. A number of parties lost their outfits in the fires and others saved them only by dint of moving to the protection of water.

An annoying impediment to progress in the western part of the gold belt is the continued inadequacy and disarrangement of the transportation service northward from Ville Marie on the Quinze and Kinojevis rivers, the natural route to the heart of the district. Early in the season, when the stage and motor boats forming the chain of communication were operated in a desultory and haphazard way, the lack of system and promptitude could be set down to the newness of the service. There have been eight weeks during which the service could have become regularised, and still it is as irregular and undependable as ever. As a consequence numbers of travellers now are literally "paddling their own canoes", having proved by trial that the public transportation service is not only undependable, but unduly expensive. This service has been subsidised by the Quebec government, which thereby owes it as a duty to the public to see that a proper service is maintained before the subsidy is paid over.

A mining engineer who has just finished a tour of the western part of the gold belt estimates from the evidence he saw that there are about five hundred bona fide prospectors in the district. Provided these were distributed evenly over the whole hundred miles of length, and assuming that the belt is five miles in width, this would put only one prospector on each square mile of ground. The fact is that the larger part of these men are working within comparatively restricted areas, and that only a handful, comparatively speaking, are to be found far from the main travel routes.

It is still much too early in the season to gauge definitely the progress of exploration work in the field. In a number of ways, however, the results during these first eight weeks are rather disappointing. Continued work on the two discoveries under investigation last winter, the Noranda (Powell) and the Hamill option (Cockeram), has failed to disclose any bonanza, but work is being pushed forward steadily with small crews. The claims held by the established mining companies have received comparatively little attention, the rule being a preliminary examination by a party of two or four prospectors. There are no authentic reports of notable discoveries by these parties; but that does not, of course, signify that continued exploration will not disclose payable ore deposits. One property toward the western end of the field, where nine men under the employ of a private syndicate have been working steadily since the break-up, has disclosed a promising find that is being developed as rapidly as this small force can do it. The examination of the old Lake Fortune property has not induced Messrs. MacKay and Alderson to exercise their option on it.

The eastern end of the gold belt, where the Harricanaw river crosses it, contains the most promising of the showings located during the former gold rush. It, too, is being re-examined this season, and we have still to learn the results. Rumours are abroad regarding finds in other parts of the belt, as at Kewagama lake, but all these have still to be substantiated.

For those at work in the woods, midsummer is the season of intense activity, during which is accomplished the solid, systematic work of exploration that precedes most discoveries. The outside world hears little of this work until it results in a find. The autumn is the usual season when such results become known. It still seems likely that the work now in progress will have its reward before the snow flies. The finding of one good mine of even moderate size will repay many times the money expended in the field to date.

$300,000 INVESTMENT IN DANGER

Unless action is taken, and taken promptly, we, the people of Canada, will lose, quite unnecessarily, the benefit of the $300,000 invested in the peat experiments during the last four years. This money has been expended wisely, in a well conceived and cleverly executed series of experiments designed to develop a mechanism that will convert raw peat, containing only 12 per cent. combustible matter, into a high-grade fuel. The engineers directly concerned are satisfied that they have developed a commercially feasible process, and the officers of the Departments of Mines in Toronto and Ottawa are likewise convinced that cheap peat fuel is now available, if we will take the pains to make it. The general public are still, however, almost completely unaware of the truth about the present situation of peat fuel manufacture, and investors still look upon the demonstrated facts and figures as "too good to be true."

"While there may be some doubt as to the results achieved [by the Peat Committee], your Committee is of the opinion that the money expended was justified, and that the Governments interested should consider the advisability of making still further efforts to more fully demonstrate the feasibility or non-feasibility of producing a suitable peat fuel for domestic or industrial purposes, which will compete successfully with other fuels now in use." This is the conclusion of the Senate Committee on Fuel Supply, contained in its final report made on June 25th. The Peat Committee and its work have had much active opposition and numerous detractors, and their evidence has resulted in the Senate Committee's mild expression of doubt. Their conclusion is without doubt — that the work should be carried to a final conclusion.

The Dominion Fuel Board, with full and intimate knowledge of the case, makes the following statement in its interim report: "Too little attention has been directed to the importance of the peat resources Canada possesses. These are very large and are strategically situated in Ontario and Quebec where coal is lacking... Experiments conducted by the Dominion government, and latterly by the Dominion and Ontario governments acting together, at Alfred, Ontario, have produced a high-grade auxiliary fuel... The process evolved is a simple one, consisting of the reduction of the moisture in the raw peat by drying by sun and wind... The Board is of the opinion that peat should be utilized to supply a part of the fuel needs of central Canada, and if the results accomplished last year at Alfred are not sufficient to induce private capital to engage in the production of this fuel, further encouragement should be given the industry by the governments concerned." There is no mistaking the tenor of this statement; the Fuel Board is convinced that the experiments at Alfred have been fully successful, and recommends that further public funds be expended in order to convince the public of the fact.

Last summer 5,000 tons of excellent fuel was made available at Alfred. This summer at least 15,000 tons should have been made there. Through a series of inexcusable blunders, the plant is idle and we shall not get a pound of peat. The responsibility for the bungling is mostly to the account of certain members of the late Ontario government, and need not be discussed here. To retrieve the situation, prompt and decisive action is required on the part of the present Ontario government.

The case of peat fuel as it stands today is briefly as follows: The work of the Peat Committee has apparently been insufficient to induce private capital to invest in a commercial plant, though, to the initiate, the commercial feasibility of the process has been demonstrated conclusively. The coöperative arrangement with the Ontario government once concluded, the Federal Department of Mines cannot logically undertake to aid further, at the expense of the whole Dominion, either of the only two provinces concerned. It therefore devolves upon the provincial governments of Ontario and Quebec to take action.

The Quebec government has offered a bounty, at a rate still to be determined, for peat fuel made in the province. The Ontario government has done nothing to protect its investment.

The idle peat plant at Alfred, Ontario, can be had for the asking by anyone with the means and a *bona fide* intention to operate it; a recent order-in-council passed at Ottawa says so. It is worth $50,000 as it stands, and a moderate sum will change it from the cumbersome steam-driven mechanism it is at present, to the electrically-driven plant the Peat Committee recommend for commercial operation. This plant cannot be moved economically to a bog in Quebec, where it would earn a bounty. If it is to be operated during the season of 1924, active steps must be taken before the snow flies to get it ready.

If private capital should fail to meet this need within the next few weeks, it is clearly incumbent upon the Ontario government to fill the breach. Under the impulse of war-time necessity a Conservative government undertook the experiment. During the last days of the succeeding government, the effort was allowed to lapse. The newly elected Conservative government has professed a keen interest in the mining industry. Here is a chance for it to fulfil these professions in practice, and to complete the task begun in 1919 with the personal support of the present Premier.

NO COMPROMISE WITH COMMUNISM

Last week Hon. James Murdock, Minister of Labour in the Federal government, made a statement that was widely circulated in the public press to the effect that "the representations of the British Empire Steel Corporation had received one hundred per cent. consideration by the Nova Scotia government while the claims of the men had been ignored." Hon. D. A. Cameron, Provincial Secretary of Nova Scotia, one of the ministers thus criticised, has sent a vigorous rejoinder in the form of a telegram in which he points out to Mr. Murdock that the men's side of the case has had continuous attention since February last, when the strike was first threatened. He points out further in connection with the presence of provincial police and militia that "when maintenance men are withdrawn contrary to the regulations of the union, some effort must be made to protect the property, not of the corporation, but of the people of Nova Scotia, who own the mines. The safety of life and property is the only object of the protection afforded and has nothing whatever to do with the claims of the men or the attitude of the corporation."

This statement brings out clearly a point that appears to be little understood either by the strikers at

Sydney or by the general public. The presence of the provincial police and the soldiers in and about Sydney is not due directly to the strike at the steel plant. It is due to the threat of the striking steel workers to wreck that plant. Similarly it is not the walk-out of miners that is the direct cause of the military occupation of the pit-heads, but the avowed intention of the strikers to allow the mines to fill with gas and water, and gradually to be destroyed.

So far as has been disclosed publicly, the provincial police of Nova Scotia and the military authorities now in Sydney have been scrupulous in observing this distinction. They are there to uphold the laws of the land and to prevent the wanton destruction of private property in the steel plant and of public and private property at the mines. They have no function to fulfil as mediators between workmen and their employers. That is the duty of others.

Determined efforts have been made by a number of public officials and others interested to reconcile the views of the contending parties but so far the conferences have been fruitless. Premier Armstrong and Mr. T. J. Brown, Deputy Minister of Mines, have expended their best efforts, and Rev. Clarence MacKinnon, who is a prime favourite with all Cape Bretoners and has been successful in settling several former strikes, has also failed on this occasion. The Lemieux Act is showed up once more as quite useless in settling a serious dispute.

As we pointed out last week, the dispute is virtually between those that uphold the laws of this land, on the one hand, and, on the other hand, those that would, if they could, institute the rule of Communism in Cape Breton and in Canada. It is quite possible that investigation will show that the steel workers and coal miners of Cape Breton have some just causes of complaint against their employers, and these can be adjusted by agreement or compromise; but it would be a crime against our country to comply in any way with the demands made with a view to establishing in Canada the régime that has wrecked Russia.

THE CONFERENCE IN EDMONTON

The gathering of railway operators and coal mine operators now in session in Edmonton under the chairmanship of Mr. A. C. Magrath is the first occasion on which those with the problem of "Alberta coal for Ontario" on their hands have come together in formal conference. Hitherto the negotiations have been of rather a long-distance variety, which may be responsible for the lack of satisfactory results. Now that there is a prospect of miners and railway men attacking the problem in concert, we may look forward to a genuine decision.

As we said when Sir Henry Thornton first announced the $9.00 rate on coal from Alberta to Ontario, we consider that this is merely a "feeler". Likewise the contention of the Alberta miners that it will cost them $4.50 a ton to put their coal on the cars contains something in the nature of a bluff.

If direct negotiations of this sort should disclose the fact that Alberta coal cannot be shipped profitably to Ontario, then the sooner we know it the better it will be for all concerned. Until the point is settled definitely and all those concerned are convinced the scheme is impracticable, there is bound to be a good deal of restlessness and dissatisfaction in various quarters. If the Alberta mines are not to have this opening for a market, they should know it as soon as possible. If the people of Toronto must continue to import coal from the United States, their contracts there should not be subjected to the doubt of an alternative Canadian supply. We trust the conference will result in a definite decision. We still hope this decision will allow the shipment of Alberta coal to Ontario.

A PROSPECTOR'S MONOLOGUE

They say our lives are lonely, pard,
That our hardships are severe;
But they do not know the pleasures
We enjoy while camping here
On this lovely pine-clad mountain,
Where the air is soft and sweet,
With the snowy peaks above us,
And the valley at our feet.

We can hear the grouse a-drumming
As we sit around the fire,
And the humming-birds are humming
On bright wings that never tire.
All around us happy families,
Birds and beasts so full of fun,
Till the "savage" from the city
Comes amongst them with his gun.

They say we hear no music —
When the woods are full of song;
Why, each bird's a prima-donna —
Never sings a note that's wrong.
And the wind above the pine-trees
Harps his way the leaves among;
Never was a grander chorus
Than when Spring-time comes along.

They think we see no pictures —
When we see them every day;
Not in galleries, on canvas,
But in Nature's grander way;
Painted not by ancient "Masters",
Nor by "Moderns", great or small,
But by Nature's mighty Artist
Greatest "Master" of them all.

DONALD C. SIMPSON.

Natural Gas and Petroleum Resources of Western Canada

III. — The Irma-Fabyan-Wainwright Gas Field

By NEWTON W. EMMENS

The striking of a big flow of natural gas in the initial well of British Petroleums Co. (Canada) Limited, in Sec. 36 of Tp. 45 N, R 7 W of the 4th Meridian, of east central Alberta seems to prove the existence of an extensive gas field in the Irma-Fabyan-Wainwright section, having a length in a northeasterly direction of at least eleven miles and of unknown width. In this eleven miles three wells have been drilled, two by the Imperial Oil Company and one by British Petroleums. The most southerly is in Sec. 4, Tp. 45, R 8 W, the second in Sec. 18, Tp. 45, R 7 W and the most northerly in Sec. 36 of the same township, as above stated. All these wells struck big gas flows, with some oil showings. It is interesting to note that the wells are along a line that is approximately 45° east of north, which coincides with the "45 degree line" so dear to the hearts of the Appalachian oil men and regarded by them as an exceedingly favorable indication of a productive field. However, it is too early yet to state that this is the real direction of the longest axis of the field, as development has not progressed far enough to enable a definite conclusion to be arrived at in this respect. It is believed that oil will be found in commercial quantities below the gas sand, to prove which British Petroleums Limited is preparing to drill another well about five hundred feet southeast of their No. 1, well using the gas from this latter as fuel.

The Imperial Oil Co. is rigging up to drill another well on Sec. 14 of Tp. 45, R 8 W of the 4th Meridian, just south of the Canadian National Railway bridge over the Battle river west of Fabyan station, and about midway between their other two wells.

Gasoline and Carbon Black from Gas

In this part of Alberta, as there is no immediate market for natural gas for domestic and power purposes, it has been deemed advisable to carry out an investigation into the nature of the gas with a view to its utilization for the production of gasoline and carbon-black. So far as this investigation has gone the results are very satisfactory, as it has been found that the gas can be profitably utilized for these purposes.

The use of natural gas for the manufacture of carbon-black has been, and is, of the greatest importance where the field from which it is obtained is situate at too great a distance from the large centres of population for other uses, and has been the means of turning more than one enterprise from a failure to a success. The Monroe field of Louisiana is a notable example of this. A few years ago several wells were drilled in the Monroe field in an unsuccessful search for oil. Although they disclosed a considerable flow of gas, they were so remote from large centres where this gas would be in demand for domestic or power purposes, that the wells were capped and the field allowed to lie dormant. When the demand for gasoline and carbon-black became so urgent during the war, this Monroe gas was tested and found to contain from one to two pints (Imperial) of gasoline per thousand cubic feet of gas, and in addition the residual gas yielded eight-tenths of a pound of carbon-black per thousand cubic feet of gas burned. Since then the Monroe field has been systematically developed and produces large amounts of both gasoline and carbon-black from this gas.

Uses of Carbon Black

In the United States the production of carbon-black is an important industry with an annual production of about fifty million pounds, in the manufacture of which some forty-one million cubic feet of natural gas are consumed. Carbon-black is a velvety pigment with a brilliancy and intensity of color equalled by no other black. Its chief use is in the rubber industry, both as a coloring material and as a filler. In the manufacture of automobile tires it also acts as a reinforcing agent, as it has been found that by the addition of carbon-black to the rubber the tire has a greater mileage and a better traction because of the increase in tensile strength and elasticity due to its use.

In the printing trade carbon-black is used in the preparation of printer's ink because it possesses properties that are especially adapted to its needs. When mixed with oil and other chemicals it has remarkable covering power, makes an instantaneous and legible impression, drys rapidly so as to allow the presses to work at a high speed, and has the fine black color so necessary for this work.

Carbon-black is also used in the paint trade and in the manufacture of black varnishes and enamels, where its high coloring properties and great covering power are unsurpassed. Smaller quantities are also used in the manufacture of phonograph records, shoe and stove polish, carbon paper, typewriter ribbons, black leather, drawing and marking inks, buttons, celluloid, electric insulators, and many other articles where the use of an intense black coloring matter is required.

Not only is there a good domestic market for carbon black, but there is a growing export trade. The market value is based on the quality of the product and the available supply compared with the demand. At the present time there is a scarcity of carbon-black and the price ranges from 17 to 50 cents per pound, the higher prices being paid for the finer ink-making grades.

Natural-Gasoline from Gas

The extraction of gasoline from natural gas owes its present large proportions to the great demand for gasoline by automobiles, trucks, tractors, motor boats and gasoline engines used for all sorts of power-purposes; and were it not for this natural-gasoline (as the gasoline extracted from natural gas is called to distinguish it from the gasoline made by distilling crude oil) the users of this useful petroleum product would be paying a much higher price than they now do, if indeed sufficient could be produced by the refining and cracking of crude oil to supply the demand. The importance of the natural-gasoline industry can be better appreciated when it is understood that hundreds of millions of gallons of gasoline are recovered annually from natural gas. In the United States the annual production has a cash value of tens of millions of dollars, and this huge sum goes to the producers of natural gas who have equipped their properties with the requisite plants, or to gasoline extraction companies who buy the gas from the lease

owners at a fixed price per thousand cubic feet, extract the gasoline and either sell the residual gas for commercial purpose or manufacture carbon-black from it.

Analysis of the Gas

Gas fields in which there is practically no market for tht gas as such — that is for domestic and power purposes — and which are within a reasonable distance of transportation, as are the gas fields of southern and eastern Alberta, afford a splendid opportunity for the building up of profitable enterprises by the extraction of the gasoline contained in the gas and the manufacture of carbon-black from the residue, provided always, of course, that the gas contains sufficient of the hydrocarbons, other than methane, necessary for such purposes. Their content of these hydrocarbons can be easily determined by an examination of the gas.

The examination and testing of natural gas for its gasoline content requires special knowledge and has proved a stumbling block to analysts who have not had practical experience in this class of work. The ordinary laboratory explosion method of determining the methane, ethane and higher hydrocarbons in natural gas is of little value in arriving at its gasoline content, for the reason that it gives only the two predominating hydrocarbons and does not give the quantity of gasoline vapor; also a very slight error in manipulation is multiplied many times when calculating the results of the analysis to a percentage basis, and the relation between the volume of carbon dioxide and the contraction produced by combustion may indicate the presence of hydrogen, although the sample being examined may be entirely free from that gas. This work should, therefore, be done by an analyst or petroleum engineer who has not only the technical training but also practical experience in this class of work, and preferably by one who has also had experience in the building and operating of plants for the recovery of gasoline from natural gas, because the gas is not uniform and not only varies in gasoline content as between wells (even when the source of the gas is the same), but from day to day from the same well.

Practical Tests

The preliminary examination of the gas is usually made by the specific gravity and the oil absorption methods, which are reliable guides as to the gasoline contained in natural gas, provided the tests are properly made. They will, however, lead to erroneous conclusions if made by those who have not had considerable experience in this work. If the results of such a preliminary examination show that gasoline vapor is present in the gas in sufficient quantity to make its recovery profitable, the next step is to make a series of field tests at the wells in which a measured quantity of the gas is passed through an apparatus that actually extracts the gasoline under conditions as nearly like those of the commercial plant as possible. These tests are required for the determination of the type of plant best suited to treat the particular gas under examinaion, because gas, like metallic ores, has peculiarities of its own that must be take into consideration in the design of a plant to get the highest efficiency.

The examination of the gas, afer the gasoline has been extracted, for the manufacture of carbon black can be made by analysis and by calculating the amount of carbon-black it will produce, or the gas can be tested in the field by actual combustion in a suitable apparatus, in which event a measured quantity of gas is passed through the apparatus and the carbon-black recovered and weighed. The writer prefers the latter method.

PETROLEUM PARAGRAPHS

The Illinois-Alberta Oil & Refining Co., is constructing a gasoline plant to treat the gas from their wells in sec. 12 Tp. 20 R 3 W of 5th Meridian. This gas is reported to yield two gallons per thousand cubic feet.

The work of laying the pipe-line from the Viking gas field to the city of Edmonton has commenced and it is hoped that the line will be completed this winter. All the necessary pipe, consisting of approximately 40 miles of 12-inch and 38 miles of 10-inch, has been bought and part of it delivered. There have also been purchased four ditching machines for digging the trenches in which to lay the pipe.

South of Taber, Alberta, in Tp. 9 and 10, R 16 west of the 4th Meridian, two wells are being drilled by the Canadian Western Natural Gas Co. for gas. This company drilled in a good gas well late last fall, but the water came in and efforts to shut it off have proved unsuccessful. It is expected that the new wells will be free from this water trouble.

South of Monitor, in Eastern Alberta, the West Regent Oil & Gas Co., has resumed drilling in Section 19, Tp. 34, R 4 W of the 4th Meridian. This hole had been previously drilled to a depth of 3,300 feet and shows both oil and gas. It is expected that much greater pro duction will be obtained by drilling deeper.

In the Sweetgrass section of southern Alberta slow progress is being made on several wells. Coutts-Sweetgrass Oils Ltd. are setting casing to shut off the water in their well in Sec. 1, Tp. 1, R 15 W of the 4th Meridian. Border Oil Ltd. are drilling in Sec. 6 Tp. 1, R 14 W of the 4th Meridian and are down some 2,300 feet. The Boundary Oil Co. is drilling in Sec. 3, Tp. 1, R 15 W of the 4th Meridian at a depth of 400 feet. The Moodie Syndicate is drilling in the same township, Sec. 4, at a depth of 350 feet and the Canadian Oil & Refining Co. is making slow headway with their test at a depth of 1,600 feet in Sec. 29, Tp. 1, R 11 W, of the 4th Meridian.

PERSONAL AND GENERAL

Dr. J. A. Bancroft and Mr. E. J. Conway, associated with the Granby Consolidated Mining & Smelting Co. as geologist and field engineer respectively, are in the North inspecting the Sunshine and George groups, which are under bond to the Company. The former is on Glacier Creek, and the latter on the Bear River.

Mr. H. S. Munroe, general manager of the Granby Co., and Mrs. Munroe, Col. Crabbs, of New York, President of the Company and Dr. Probert, Dean of Mining at the University of California, passed through Stewart recently and, after a short stay in the Portland Canal District, returned to Anyox, the Pacific Coast headquarters of the Company.

Dr. W. E. Cockfield is now in the Mayo silver district, having spent the latter part of May and the first part of June in the Whitehorse district. The survey of the latter area he has left in charge of Mr. A. H. Bell.

Dr. T. O. Bosworth has recently returned to London from Canada, where he has conducted certain investigations affecting British petroleum interests,

The Quebec Asbestos Industry

II. — Efficiency in the Milling of Asbestos

By G. ERNEST BOOKER

The fact that the milling of asbestos is to a large extent inefficiently carried out naturally leads one to search for improvements that will either increase the overall efficiency to the greatest extent, as in the case of a new mill, or will enable one to make such changes in an existing mill that the losses at present taking place are considerably reduced. The first consideration must therefore be the grouping of all the essential features an efficient mill should include. As a full discussion of the details to be considered under the various groups is beyond the scope of this article, it will be sufficient to note the headings of the several groups:

(1) Economical milling efficiency
(2) Mechanical and thermal efficiency
(3) Reliability and continuous operation
(4) Accessibility
(5) Labor and its welfare.

While the factors that enter into the general design and layout of a mill are too numerous to mention, they may all be classified under the above heads. The value of each detail under any heading has not only to be considered in one phase only, but also in its bearing and value in relation to the other groups, thereby co-ordinating each and every process or operation into a complete unit.

Design of a 1,000-ton Mill

These details will, of course, vary in every case, and as it is impossible to designate fixed values for particular points or features, it will be as well to take as an example the preliminary plans of a 1,000-ton mill recently designed.

The flow sheet (fig. 1.) is self-explanatory, and while it is very similar to some existing mill flow sheets, the addition of both a mechanical and an electrical dust treating plant is perhaps worth attention.

The question of dust treatment for the recovery of fibre at present lost is a vital one and results can be achieved in any of the following ways:

(1) By settling in a dust chamber
(2) By electrical precipitation
(3) By combined mechanical separation and settling.

Full details of this dust and fibre recovery problem will be dealt with later. In this case, however, we have the second and third methods of dust treatment included. The object in view is to recover the longer and more valuable grades of fibre from the dust passing through the mechanical unit before the general precipitation takes place, thereby ensuring a maximum extraction and minimum loss.

Details of Flow Sheet

The preliminary plans of the mill (Fig. 2.) may be briefly described with advantage. The rock bin is fed directly from the mine by an automatic skip, and leaves the bin on a 12" grizzley, all oversize material going through the primary crusher before joining the undersize and passing through the secondary crushers. From here it is fed into the dryers and in due course passes into the primary separators. It will be noted that up to this point gravity has been the sole conveying medium.

The rock leaving the primary separators is then carried by an inclined conveyor to the feeders supplying the secondary separators, the tailings from which descend by means of a chute to the tailings conveyor which deposits them upon the dump. The fibre from all sources goes through a series of cleaners and graders to the bagging machines from which it is carried by means of the shipping conveyor directly to the freight cars or taken into storage as desired.

Treatment of Dust

The dust collected from all sources is first led into the mechanical dust separator, which extracts all of the longer fibres that are carried along with it, the balance going into the electrical precipitator which precipitates all the remaining solid matter.

It might be mentioned in passing that the dryers are of the Straight Flow type, and oil fired. The advantages of oil as a fuel are well known and it is expected that the increased cleanliness and freedom from sooty deposits in addition to the flexible temperature control will prove highly economical and also will produce cleaner fibre.

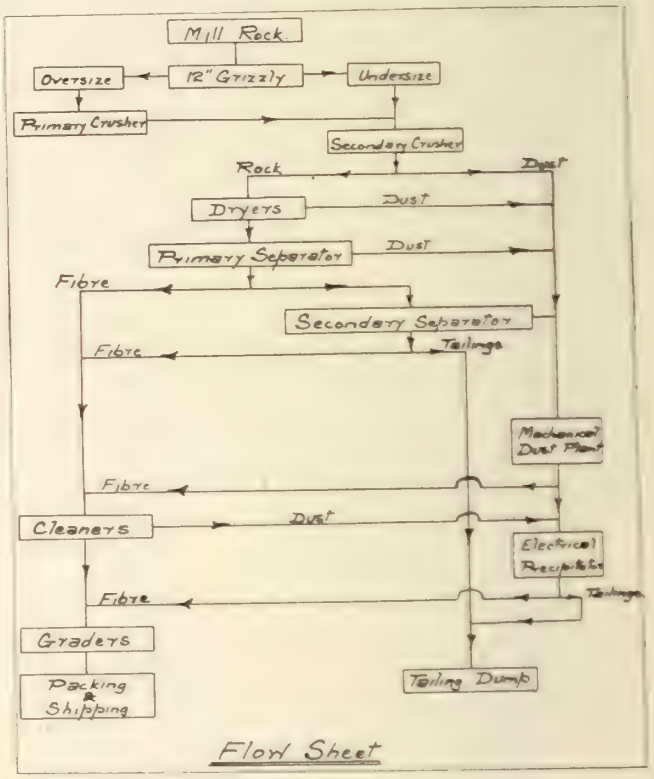


Fig. 1.

Concrete Construction Best

The type of construction used for the mill building and rock bin is probably the greatest change from present practice. The vibration usually found in any milling process has always been a source of trouble and probably will be until efforts are made to neutralize its effects. In the old type of timber framed mill building the vibration actually originating at the machines becomes magnified considerably and the resultant vibration is frequently so great that not only is the maintenance and wear on the machines excessive, but it also results in the ultimate destruction of the building itself.

The monolithic concrete building of which this particular design is an example tends to nullify the vibration of the machinery and thereby to eliminate the cause of much expense and loss in maintenance and replacement.

Other points that increase the desirability of the monolithic concrete building are the fire and weather resisting

qualities, the increased lighting and improved working conditions. It has been proved that not only do proper lighting and reduced vibration increase the efficiency of the mill hands, but also that the elimination of dust and generally improved working conditions show beneficial results in the relations between employers and employees, as well as greater production.

The cost of construction today of reinforced concrete buildings is almost identical with that of similar timber framed buildings.

Fibre Moves Continuously from Crushers to Bagging Machine

Another point that may be mentioned is the arrangement of the equipment. The fibre from the time it is separated from the rock is not allowed to rest until it is in the bagging machines. This is a radical change from the all too common practice of moving fibre at a high velocity through a part of the mill, then bringing it to a standstill at another point only to expend more power and energy in helping it through the remainder of its travels. It will be seen that the actual distance travelled by material through the mill and the power absorbed in elevating and conveying has been reduced to a minimum, the actual distance in this case being about 300 feet, the vertical component of which is only about ten per cent.

Re-Modeling Old Mills

Turning to the question the efficiency of existing mills, the matter resolves itself into three problems; first, the location of all present losses; secondly the proper application of remedies to prevent the recurrence of such losses;

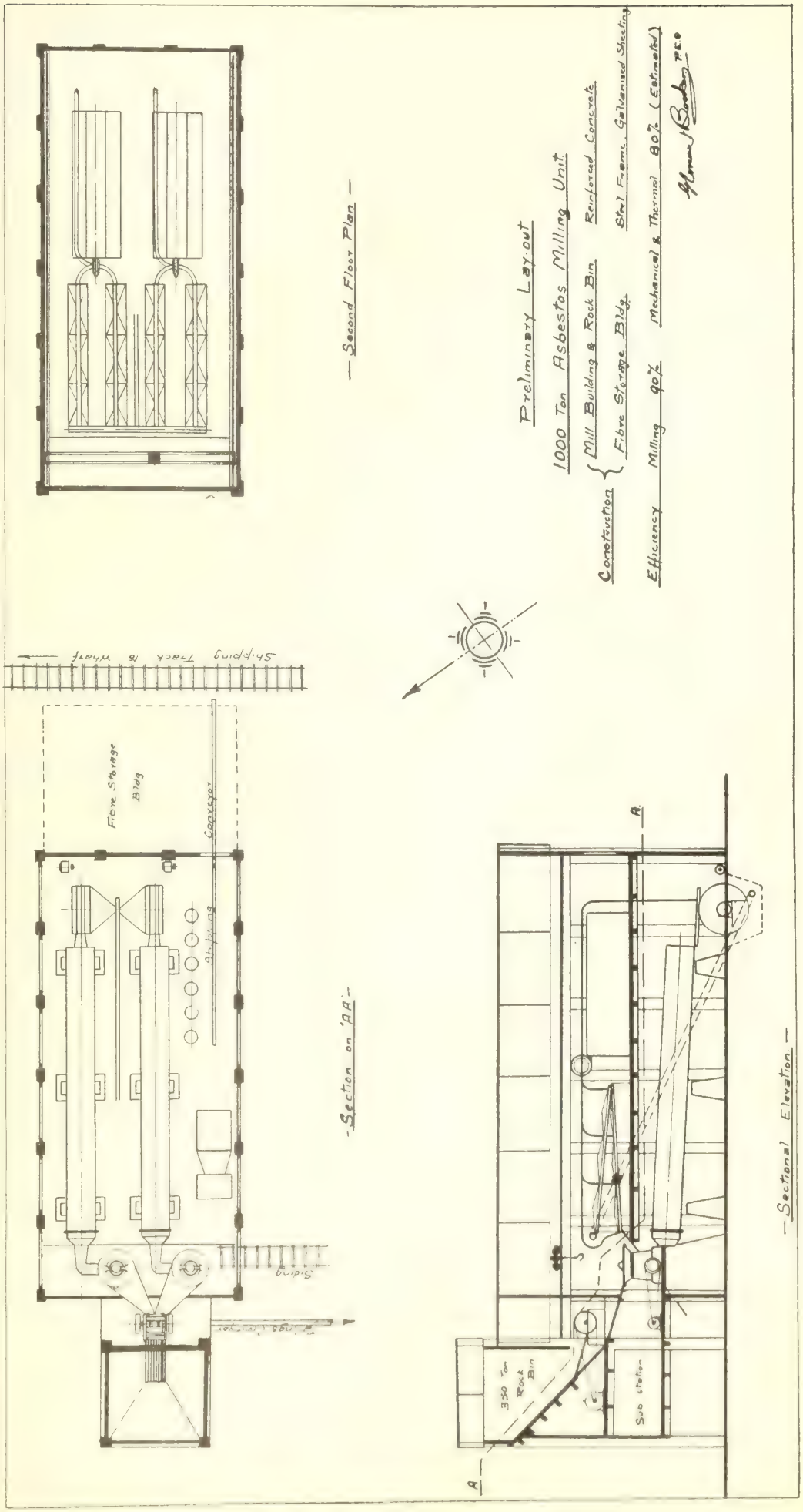


Fig. 2.

and thirdly, the most suitable means of recovering, grading and handling the additional fibre in the dust at present lost. The first point naturally calls for a thorough examination of all the equipment in the mill under consideration. This achieved, the necessary changes and replacements are of a simple nature in many cases and can be carried out by the mill crew, or the millwright gang.

The choice of a type of dust treating and fibre recovery plant is, however, so much dependent upon the actual conditions prevailing, that the possibilities of each type, its advantages and disadvantages, must all be carefully considered for each case. The problem is one of prime interest, and when the possibilities of each type of treatment are described it will be as well to attempt to determine whether or not dust or fibre-laden air is similar in its behavior to a colloid, which is a fluid containing solids in permanent suspension.

MACKENZIE RIVER MAPS

The Mackenzie river, the largest of all Canada's water systems, does not present to the traveller today the difficulties and dangers of former times. Tapped by railways at two points and traversed by up-to-date steamers, the waterways of which this river forms a principal part may be travelled to the delta of the Arctic ocean in all the comfort and security that attends inland water transportation.

With the increase in interest in this district that has been brought about by recent oil and other mineral discoveries, as well as from the general enlightenment regarding it that has seemed to pervade the older parts of Canada in the past few years, the need for accurate and authentic information in the matter of surveys has been felt. To meet this need, surveys have been carried on by the Topographical Survey of Canada, Department of the Interior, along the main waterways of the district, since 1921 and are being continued this year.

As a result of these surveys, a series of thirteen maps of this district has been issued embracing besides a general large scale map of the entire area, detailed maps of the lower Athabaska and Slave rivers, Lake Athabaska, Great Slave Lake and the Mackenzie river They are printed in three colours, each map being 24 inches by 34 inches in size. In addition to the outline of the waterways themselves, they show all islands and shoals, the navigation routes usually followed, magnetic variation at various points, the positions of the survey monuments erected and in general all known information relating to the topography of the country.

The maps are divided into series "A" and series "B", issued in separate covers. Series "A" includes besides the general map on a scale of fifty miles to an inch, two maps on a scale of four miles to an inch and one on a scale of six miles to an inch. The first two take in the districts respectively from McMurray to Chipewyan and from Chipewyan to Fort Smith. The third is of lake Athabaska. Series "B" includes, also besides the the general map, nine maps, eight of which take in the districts respectively from Fort Smith to Resolution, Resolution to Fort Reliance, Resolution to Windy Point, Providence to Simpson, Simpson to Wrigley, Wrigley to Norman, Norman to Hume river, Hume river to Thunder river including Good Hope, and from Thunder river to McPherson. Those of the latter series are on a scale of four miles to an inch with the exception of the second one mentioned, which is on a scale of six miles to an inch.

Single copies of these maps or the complete set may be obtained free of cost from the Surveyor General, Ottawa. Additional copies may be obtained at twenty-five cents for individual maps or seventy-five cents for series "A" and two dollars for series "B".

BLUE SKY LAWS FOR CANADA

The *Financial Times* of Montreal has been actively interested during recent months in the question of a "Blue Sky" law for the province of Quebec. In the issue of July 14th it sums up the present situation as follows:

"When Quebec Province, with its conservative tendencies in legislation, is giving serious consideration to a Blue Sky law, it seems clear that behind it rests a more or less widespread demand among some sane financial houses.

"Blue Sky laws are very much like free trade — ideal in theory but rather difficult in practice. The danger that has been found to result in the past has been that the authorization of a public issue under provincial or State regulations, has been assumed to carry with it a guarantee as to the desirability of such an issue as an investment. It has been looked upon almost in the light of a Government bond. So much so that the Province of New Brunswick has taken care to have a special note appended, warning intending investors that authority to sell securities is in no sense to be regarded as a testimonial of their merits.

"Probably the strongest features of such legislation arises from the enforced publicity through information that must be filed with the central authorities. This stops some crooks. Then the licensing of salesmen as well as firms has been found beneficial. It is a little harder to fleece the unwary, particularly for outside salesmen with fake schemes who swoop down upon a district and then disappear with the savings of the public.

"The legislation for the Province of Quebec should enforce fuller information in the prospectus as a protection to investors against that type of promoter who is unloading at an excessive price upon the public. Then there should be some penalty, easily enforced, against the firm or salesman who are parties to fraud.

"Many Blue Sky Acts are satisfied with the cancellation of the license. But this is not enough. Apart from outside propositions — including scores of those oil prospectuses that have taken millions out of small investors — the type of issue that seems likely to call for most careful supervision is the mining stock. A rush of these is probable in the new gold area of Quebec. The Blue Sky law should make it impossible for owners of claims and promoters to absorb the whole of the proceeds. A new mine is ordinarily a gamble: the large proportion of the funds available must be expended in development work; otherwise the investor has no chance to win out.

"The Blue Sky legislation of Quebec, with careful handling, can be made of material benefit, not only to the investor, but to the better class of financial houses who will welcome better legal protection against unscrupulous and irresponsible transactions.

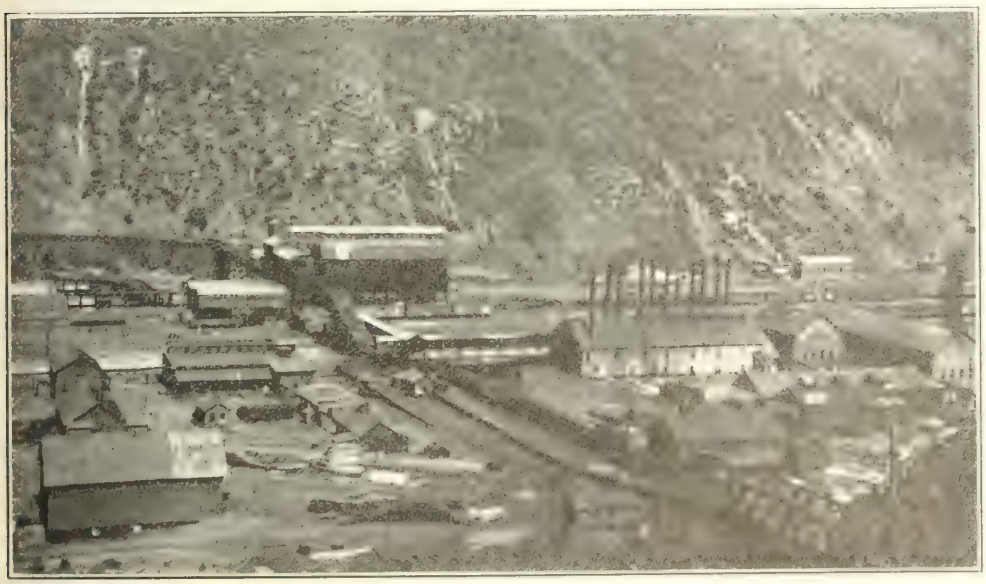
Molybdenite and graphite are very much alike, but molybdenite is blue-black, while graphite is gray-black. When the marks made on rough porcelain are compared, the molybdenite shows a greenish tint, while the graphite mark is pure gray; this difference can be seen when the marks are made on paper and rubbed until they are spread out thin.

The Collieries of British Columbia

II. — Michel and Corbin

By ROBERT DUNN

The Coal Creek collieries are under the management of Bernard Caufield, who, in common with Mr. Wilson, the President of the Company, has faced for years the problem of mining coal under exceptional conditions. George S. Rice of the United States Bureau of Mines, as a result of an investigation following a disastrous "bump" in November, 1916, reported that the Coal Creek coal beds were very gassy, and that their exploitation presented unusual natural difficulties because the beds are at the base of elevated plateaus and it is impossible to reach the coal except through the outcrop, and also for the reason that the coal is under such a heavy load that it requires great care in mining to prevent squeezes and "bumps". Mr. Rice stated that these "bumps" are believed to be caused by the subsidence of the roof in certain areas under rigid rocks, leaving a great unsupported span of rock strata. "When one of these has given away" he said, "it means the hammer-like blow of thousands of tons of rock striking on the immediate roof or flexible stratum overlying the mine, which imparts the blow downward, breaking timber, causing extensive falls in the mine and sending rock tremors through the strata." At that time Mr. Rice made a number of important recommendations, which were followed up by others from time to time by officials of the Provincial Mines Department, all having in view the promotion of safety in the underground workings of these mines. These regulations have been faithfully adhered to by the company. There has been a regular and rigid inspection by Robert Strachan, the Senior Inspector of Mines, and as a result of these combined efforts conditions have, without a doubt, very materially improved in recent years.



Michel Colliery, Michel, B.C.

Michel Colliery

The Michel Colliery of the same Company, Robert Bonar, Manager, is situated on both sides of Michel Creek and is connected by rail both with the Canadian Pacific and Great Northern Railways. There are three mines, No. 8, No. 3 and No. 3 East, but during the past year practically all production has come from the first two mentioned. In No. 3 East the work has consisted chiefly in the developing of a new seam in No. 16 East Level off the main slope and in general repairs to the roadway.

The general method of work is pillar and stall in all the mines, pillars being extracted in certain portions of No. 3 East and No. 8 mines. Haulage is by horse from the working-faces to the partings, from which the loaded cars are taken to the tipple by means of gravity-inclines, main and endless-rope haulage, and compressed-air locomotives.

As No. 8 mine is at an elevation of 500 feet above the tipple, the loaded cars from this mine are weighed at the top of the incline, where the coal is dumped into bunkers, then loaded into skips and lowered by gravity, and again dumped into other bunkers situated at the bottom of the incline, where it is loaded into mine-cars, these being conveyed to the tipple by endless-rope haulage.

The Tipple

A steel tipple, 664 feet in length and 14 feet in width, extends right across the valley and receives coal on both sides; the loaded cars from the south side are weighed at the foot of the tipple incline, up which they are taken by a Green car-haul consisting of an endless chain that travels on car-wheels, the latter acting as pushers or retarders of the mine-cars on the incline. The track for the mine-cars is laid inside that on which the pusher-wheels run, and when a car is delivered at the bottom of the incline the pusher-wheels move in behind, gripping the rear wheels of the car, thereby conveying the loaded cars up to the dump on the tipple.

This dump is a continuation of the track, with a pitch increasing from 20 to 60 deg. and when the car reaches this pitch the door opens, discharging the coal into the dump, the chain-haul continuing to travel round a large sprocket-wheel, conveying the car to the overhead track and then back down the incline. On the No. 8 side of the tipple the cars are dumped by an automatic dump and returned by a trimmer underneath the track to the endless-rope haulage, which conveys

them back to the bunkers at the bottom of No. 8 incline. The tipple is equipped with shaking screens and picking-tables, the slack being conveyed by a travelling belt to the slack-bins, from which it is drawn into cars and conveyed by steam-locomotive to the coke-ovens. The tipple machinery is driven by electric power, provision being made for loading open and box cars, the latter being handled by two Smith gravity box-car loaders,

Surface Plant

The boiler-plant consists of eleven boilers having a total capacity of 1,650 horse-power, and along with the engines are housed in a fire- proof brick building. Power to drive the underground hoists and pumps is provided by two compressors — one of the Walker, the other of the Rand type — having a total capacity of 8,000 cubic feet of free air a minute, compressing it to 100 lb. to the square inch. Power to drive the air-locomotives is provided by a high-pressure Rand compressor having a capacity of 1,450 cubic feet of free air a minute compressing it to 1,200 lbs. to the square inch.

The electric plant consists of two 250-kw. generators, which provide the power for the tipple machinery and lighting purposes around the colliery and the town of Michel.

A well-equipped lamp-room is situated in a central position at the mines, where the electric head-lamps used by the workmen and the Wolf safety-lamps used by the officials for testing purposes are cleaned and repaired. There are in use at the present time 345 electric head-lamps of the Edison type and twenty Wolf safety-lamps, while Burrell gas-detectors are provided to enable the detection of lower percentages than could be detected by the ordinary safety-lamp.

Large stables are provided for the forty horses employed in and around the mines; those employed underground are brought out at the end of shift. A large wash and change room is located convenient to the mines where each employee has his own locker (of steel construction) and provides his own soap and towel. Well-equipped machine, blacksmith, car, and repair shops are located in a central position at the colliery.

Mine No. 3, M. Littler, overman, operates on the upper No. 3 seam and is reached by a crosscut tunnel from the surface, which intersects Nos. 5, 4, 3 and upper No. 3 seams, only the last being mined. A Sullivan fan, 12 x 6 ft., delivers 104,870 cubic feet of air a minute. No. 3 East Mine, M. McLean, overman, is situated about half a mile east of the tipple and is ventilated by a 16 x 8 ft. Wilson fan giving 97,600 cubic feet of air per minute. No. 8 Mine, A. Howden, overman, is on the north side of the valley and operates the upper portion of the No. 8 seam. It is ventilated by a compressed air driven 8 x 4 ft. Murphy fan with a per minute capacity of 43,800 cubic feet of air.

The Corbin Collieries

The Corbin Coal & Coke Co., Rush Taggart, New York, President; R. S. Ord, Spokane, Washington, General Manager; and E. L. Warburton, Corbin, Mine Manager, is 14 miles from McGillivray Junction on the Crow's Nest Branch of the Canadian Pacific Railway. It is reached by means of a branch line called the Eastern British Columbia Railway and consists of Nos. 4, 5 and 6 mines. All the output for 1922, however, came from Nos. 4 and 6 mines. No. 3, or the "Opencut", where the conditions were such that the coal was simply shoveled from the outcrop into waiting cars, has not been worked recently. In 1921 the plant was dismantled.

The surface equipment may be briefly described as follows: The boiler plant, consisting of two Jenckes return-tubular boilers and one of the locomotive type, has a total capacity of 275 horse-power. The electric plant consists of one 70 horse-power generator, alternating type, 2,300 volts, driven by one 100 horse-power steam-engine, and provides the power to drive the motors at the machine-shops, the fan at No. 6 mine, and for lighting purposes around the town of Corbin.

The tipple, constructed of wood, has a bunker capacity of 1,200 tons and is equipped with a Marcus screen and conveyor-belt, driven by a 60 horse-power steam-engine. A lamp-room is located in a central position at the mines, where all safety lamps are cleaned and repaired.

The lamps in use are chiefly the Edison electric type, the remainder being the Wolf safety, the latter being used by the officials for testing purposes, while a Burrell gas-detector is provided for the detection of lower percentages of methane in the mine-air than can ordinarily be detected by the Wolf safety-lamp.

No. 4 Mine is operated on No. 4 seam, the bulk of the coal being produced from the 400 and 500-ft. levels, where the pillars are extracted by the caving system on the retreat. W. Almond is the overman. No trouble has been experienced recently with fire, which has been a difficulty in the past, there being an area sealed off in the 400-ft. level for this reason. No. 5 Mine did not produce last year but a considerable amount of development was done in No. 6, where three separate districts have been opened up and are in a position to produce. Only the lower seam, which is about 40 ft. thick between walls, now is being operated. It is being blocked out on the double stall method, pillars between levels measuring 70 x 120 ft. A small Sirocco fan provides ventilation.

No. 4 Mine, Corbin, B.C.

Production for 1922

The total output of the coal mines of the Crow's Nest field for last year was 554,361 tons, as compared with 759,755 tons for 1921. While this shows a decline it is to be remembered that the mines were shut down for almost five months as a result of a dispute as to wages. This fully accounts for the falling-off of production. Up to the present this year there have been no interruptions and, although there is no doubt that the Fordney

tariff is having its effect on exports, the coal of this district appears to be finding a profitable market. There are indications that it is invading with success some parts of the Canadian prairie market, and, as it is a splendid domestic fuel comparing more than favorably with most of that of the Province of Alberta, there is no reason to doubt that it is destined to attain greater popularity among the consumers of the provinces of Saskatchewan and Manitoba.

(To be continued)

LOW-TEMPERATURE CARBONIZATION OF COAL

Description of 400-ton Plant now under Construction at Walkerville

The 400-ton carbonization plant now under construction by the Ford Motor Co. of Canada at Walkerville, Ontario, is described in an article by V. Z. Caracristi in *Power* for May 29th, 1923. Mr. Caracristi and his associate Emil Piron, who had previously specialized in high-temperature coke oven practice, two years ago tackled the problem of designing a practical apparatus for the low-temperature distillation of coal, and after a series of laboratory experiments and the erection and operation of a small experimental unit of 25 tons daily capacity at Huntington, West Virginia, completed the design of the plant being built at Walkerville. Mr. Henry Ford has supported this enterprise from its inception.

An effective carbonization plant has been the object of scores of researchers and half a dozen governments during the last decade. By this means fuels at present regarded as low grade can be made to produce high-grade fuel as well as eminently useful by-products. "At present there is no commercial advantage in distilling at low temperatures such coals as give metallurgical coke, because of the great value of such coke. Low-temperature carbonization can be most advantageously applied, however, to coals and lignites that do not yield good metallurgical coke but will provide a material that can be mixed with coal containing the resins necessary for agglomeration into coke, in proportion to the amount of such resins available, the resulting product being a metallurgical coke of high quality... The greater part of fuel available for power plant and gas-making purposes is high volatile coal. The efficiencies obtained in the conversion of this fuel into steam and gas have reached a point where the field for improvement is practically negligible. This has been clearly realized not only by individuals but by public bodies and governments, and a vast amount of energy has been expended in an effort to extract from this fuel, before its destructive combustion, a number of valuable products."

The New Oven

The oven designed by Messrs. Caracristi and Piron uses the same essential ideas as that used to make by-product coke, adapted to meet the special requirements of low-temperature carbonizing. The principal novel feature is that the fuel, crushed to pass a half-inch ring, is fed in a horizontal layer one-half inch thick on a conveyor 9 feet wide, which passes through the length of the oven, 40 feet, in five minutes, when the coal is thoroughly carbonised (10 to 15 per cent. volatile remaining) and drops off the conveyor. The problem of supplying heat effectively to this thin layer of coal has been solved in a very ingenious way. The conveyor is made of interlocking segments of cast iron, which floats in a shallow bath of molten lead. The hearth that holds this lead is composed principally of cast iron U-shaped tubes placed side by side, the legs projecting upward into combustion and exhaust chambers on either side, these chambers being separated from the distillation chamber in the centre by curtain walls of fire brick. The walls of these tubes or flues, the melted lead above and the iron plates of the conveyor constitute a metallic conductor whose efficiency is almost perfect. It is the low efficiency in conduction of the partition walls between coal and fuel gas that has frustrated most former attempts to design an effective low-temperature carbonization oven.

The new oven makes use of the usual regenerators to conserve heat, and likewise uses the heat of the prepared coal by returning it, with the coal conveyor, on a separate coke conveyor beneath the oven. The coke needs no quenching on being discharged from this coke conveyor, which is sufficient demonstration that little heat is lost at this end of the operation. With proper insulation, it is calculated that the operation will consume 560 B.t.u. per pound of coal treated, allowing 80 per cent. efficiency for the apparatus as a medium for the transfer of heat. "Assuming that the coal has 13,000 B.t.u. as received, the heat losses will be 4.3 per cent., and the thermal efficiency of the process will be 95.7. In view of the ordinary daily operation of high-temperature coking plants, where a heat efficiency of 92 per cent. is not unusual, this figure will balance correctly with accepted data."

The Products

The distillation is effected at a temperature of 1200° F. The fuel obtained is of a coke-like character, high in carbon, with not more than 15 per cent. volatile, which will burn without smoke and can be used: (1) "to be briquetted into a smokeless domestic fuel of anthracite character; (2) to be pulverized and burned directly in furnaces; (3) to be burned directly on chain-grate stokers; (4) to be ground and mixed with high-volatile coal for the purpose of making metallurgical coke." The by-products, per ton of coal, are: (1) "8,000 to 7,000 cu. ft. of 600-700 B.t.u. gas; (2) 5 gal. motor fuel directly stripped from the gas; (3) ammonia corresponding to 20 lb. of ammonium sulphate stripped from the gas and condensation liquor; (4) 25 to 30 gal. of crude tar, light and oil-like in character, as the main condensation product, from which will be derived (a) 5 gal. of motor fuel; (b) 2½ to 3½ gal. creosote oil; (c) 1½ to 2½ gal. lubricating oils, and (d) 8 to 12 lbs. lubricating grease." There will be also from this latter distillation a residual oil of tar-like character, suitable for use as fuel oil. Regular high-temperature practice gives about 12,000 cu. ft. of gas, but the heat valve is less (500 to 600 B.t.u.) The regular coke-oven also gives a higher yield of ammonia, as a part of the nitrogen in the coal remains in the low-temperature coke. The latter gives, however, from 10 to 20 gal. more of tar than the regular coke-oven, and this tar contains a larger proportion of the lighter and more valuable oils.

It is expected that the 400-ton plant at Walkerville will be in operation about October 1st next. Meantime the construction of the first unit of a 4,000-ton plant at River Rouge, Detroit has been undertaken by the Ford Motor Co.

A branch of the Royal Mint for South Africa has been completed recently in Pretoria.

Investigations by the Mines Branch of the Department of Mines, 1923

By JOHN McLEISH, Director

During the season of 1923 the Mines Branch will undertake field investigations of Mineral Resources and their technology and of the Mining Industry through ten parties, in addition to field studies directly related to laboratory investigations; and in the laboratories and experiment stations at Ottawa it will conduct a variety of tests, experimental and research work, on determining the character and values of ores, fuels and mineral products for their treatment and for the efficient recovery of their valuable constituents.

Field Investigation of Mineral Resources

The field investigations of Mineral Resources and of their technology are designed through published reports on individual mineral products to furnish the interested consumer, investor or prospector with a record of the localities where the occurrence of economic mineral resources has already been determined and with the available data as to the extent both of their occurrence and of their exploitation. To the discoverer, owner or expectant operator are furnished the collected and accumulated data respecting the physical and chemical characteristics of mineral products; descriptions of methods of mining and treatment commonly employed; the specifications as to the composition and character of the products required to meet market conditions; the uses to which the products are put; the industries in which they are employed, and the essential commercial data respecting markets, prices, consumption, etc.

L. H. Cole, with **H. A. Leverin** and **M. F. Goudge** in charge of sub-parties, will continue investigations, in progress during the past two years, of the alkali lakes of western Canada, with a view to determining their distribution and character and estimating the quantities of sodium and magnesium salts available. A study will also be made of the methods of preparing the salts for market and of market requirements.

Sodium sulphate, sodium carbonate and magnesium sulphate found in these deposits are important in industry and are at present largely imported for Canadian consumption. Sodium sulphate is the salt that occurs in largest quantity in these alkali lakes. At the present time the Canadian Kraft paper industry imports into eastern Canada from the United States about 35,000 tons per annum of this product and important quantities are also used by glass manufacturers. It is probable that the near future will witness developments of paper manufacture and other industries in western Canada that will utilize these sodium sulphate deposits with a minimum of transportation. These deposits are of limited extent but are such that their quantity can be ascertained within reasonable limits. A knowledge of our resources in this particular is essential to their intelligent administration, and is equal in importance to their utilization in domestic industry.

S. C. Ells will continue and complete his topographical surveys of the bituminous sands of northern Alberta from Fort McMurray to Township 100 on the Athabasca river. Serious study is being made by various companies and organizations of the possibilities of these sands as a source of bitumen for road making, as well as a possible source of oil.

V. L. Eardley-Wilmot will investigate natural abrasive materials in Canada. Studies will be made of the occurrence, character, methods of preparation for market, industrial uses, etc.

H. S. Spence will devote some time to further studies of the bentonite of Alberta and British Columbia, with particular reference to possible economic occurrences, uses and markets. Mr. Spence will also review present conditions and developments in several industries, on which special reports have already been issued.

A. W. G. Wilson will, if the work is not otherwise assigned, investigate the technology of the recovery of arsenic, the production of arsenious oxide and the uses and markets both in Canada and in the United States. This will supplement an investigation of Canadian occurrences of arsenic being made by the Geological Survey.

A. Buisson, A. H. Robinson and others will make general enquiries and collect information respecting progress being made in the development of the Mineral Industry, covering as many metals and products as available time and staff will permit.

R. T. Elworthy of the Chemical Division will make a field study and chemical investigations of natural gas in western Canada, with particular regard to the determination of the composition, character and gasoline content of these gases. Gases containing ethane and hydrocarbons other than marsh gas appear to be in considerable demand at the present time for the manufacture of carbon black. Exploration for petroleum in Alberta and other parts of western Canada is developing numerous sources of natural gas, many of which will for years be too far removed from centres of population to be available for ordinary industrial use, but which may prove to be valuable sources of a number of important by-products.

C. S. Parsons of the Ore Dressing and Metallurgy Division, will visit gold milling and metallurgical works in connection with laboratory investigations on gold ores.

J. H. H. Nichols of the Fuel Testing Division, will collect representative samples of coal from the mines of New Brunswick and Nova Scotia for laboratory and commercial scale tests, with particular reference to their coking qualities.

E. S. Malloch will make field studies of the present methods of utilizing and burning fuels both for industrial and for domestic heating.

Howells Frechette, Chief of the Ceramic and Road Materials Division, together with a ceramic engineer to be appointed, will make a general investigation of the brick industry in Ontario and Quebec and will conduct a special study of drying problems in this industry.

H. Gauthier will make a special study of the endurance of recently built highways in Ontario and Quebec, to determine the relative merit of the various types of material used in their construction.

R. H. Picher will continue the investigation of road materials adjacent to highways about to be improved in the provinces of Nova Scotia and New Brunswick.

Laboratory Testing And Research

The laboratories, or experiment stations of the Mines Branch are equipped for both small and large scale experimental work on ore concentrates; for comprehensive physical and chemical tests on fuels and oils; for complete physical and kiln tests on clays, ceramic and refractory materials; for complete physical tests on rocks, sand and gravel used for road building purposes; and generally for physical tests on structural materials.

Ore Dressing And Metallurgical Division

In this Division, under the direction of Mr. Timm, Messrs. C. S. Parsons and R. K. Carnochan, with the assistance of a staff of chemists are carrying on the following investigations on ore treatment.

Copper Ores: Experimental work on the concentration of (a) the lower grade copper ores of Hidden Creek, Anyox, B.C. Tonnage checks will be made to determine whether the results from the small scale laboratory work can be obtained on a larger scale; (b) the Flin-Flon disseminated ore of northwestern Manitoba; (c) the copper-gold pyrrhotite ores of Rossland, B.C., to improve efficiency of recovery of values; (d) copper-gold ore from the Belmont-Surf Inlet mines, Surf Inlet, B.C.; and (e) the copper ore from the mines at Copper Mountain, Princeton, B.C.

Copper-Nickel Ores: (a) Small scale tests on the concentration of the lower grade copper-nickel ores of the Sudbury district will be supplemented by large scale tests. (b) Further investigations on the determination of the precious metal values in the Sudbury ores, the Shebandowan copper-nickel pyrrhotite ores and other Canadian pyrrhotite ores, and in the concentration and reduction of products from these ores. This also is to confirm, on a larger scale, previous small scale tests.

Lead-Zinc-Silver Ores: (a) On the concentration of East Kootenay ores to determine the possibilities of improvement in cencentration and the most suitable reagents to use in flotation. (b) An investigation of the carbonate ores to determine a process for treatment.

Gold Ores: (a) On the treatment of Kirkland Lake gold ores; investigation of difficulties in making high recovery, (b) A test on the concentration and treatment of samples from the new gold fields in Rouyn Township, Quebec; (c) On the metallurgical treatment of typical Nova Scotia gold ores. It is believed that previous metallurgical practice did not result in a good recovery.

Iron Ores: An investigation has been begun on the leaching and electrolytic deposition of pyrrhotite ores and the roasting, leaching and electrolytic deposition of pyrite ores for the production of electrolytic iron and the recovery of the precious and non-ferrous metals that may be contained.

Molybdenite Ores: Tonnage tests will be made upon a shipment to be made from deposits near Amos, Quebec.

Flotation Re-Agents: Considerable progress has been made in an investigation begun last year into the use of various flotation re-agents in the concentration of mineral ores. The purpose is to stimulate the use of Canadian-made flotation reagents.

Pyrites: Tonnage tests are being made on the concentration and separation of pyrites ores from the Eustis mine, Quebec.

Asbestos: Some preliminary work has already been done, and it is proposed to continue an investigation of the wet separation of asbestos fibre from the rock.

Fluorite, Calcite and Barite: Small scale laboratory work on the separation of fluorite, calcite and barite in the fluorspar from the Madoc district has developed a promising process for the separation of these minerals, and it is proposed to conduct larger scale test work, to obtain further data and determine whether the process can be applied in practice.

Division of Fuels and Fuel Testing

Under the direction of Mr. B. F. Haanel, investigations are being carried on by E. S. Malloch, Technical Engineer; R. E. Gilmore, Chief Engineering Chemist and a staff of Engineering Chemists.

Lignite Coals: A continuation of work that has been in progress for a number of years including: (a) small scale work to determine the feasibility of carbonizing the lower grades of Alberta coals; (b) determination of the feasibility of briquetting the carbonized residue, obtained at different temperatures, from lignite coals.

Bituminous and Other Coals: (a) Relation of the coking properties of certain Alberta coals to their sparking qualities when burned in railway locomotives; (b) general classification of Canadian coals according to the area in which they are found and according to their general characteristics and chemical compositions; (c) investigation of the physical properties of different Canadian fuels and their products.

A special investigation will be made of New Brunswick and Nova Scotia coals with particular reference to their possible use in the production of a domestic, or house heating coke. This will include detailed chemical examination of the coals followed by large scale coking tests on selected coals and on mixtures of coals.

Peat: (a) Relation of degree of maceration to the drying and handling properties; (b) effective heat pressure and reagent treatments on the structure and chemical composition of peat.

Oil Shales: Development of standard methods of examination; (b) adaptability of oil shale for refining purposes and also as a motor fuel for internal combustion motor engines.

Crude Petroleum and Oil Products: (a) Canadian shale oil as a source of gasolene, illuminating, lubricating and fuel oils, etc.; (b) general examination of crude oils and crude asphaltic bitumen occurring in Canada.

Gasolene and Lubricating Oils: Survey of gasolene and lubricating oils sold throughout Canada, for the purpose of deciding on the feasibility of establishing standard specifications for each, for use (1) by various government departments and (2) by the general public.

Other Motor Fuels: Adaptability of natural and synthetic motor fuels such as industrial alcohol, bensole ,synthetic alcohol from a producer or natural gas for use in variable compression internal combustion engines.

Pulverized Fuel: The testing of pulverized peat, lignite and other coals on a commercial scale to determine value for the generation of steam.

Domestic Heaters: Investigations are being continued having in view the determination of efficiencies of fuels and other factors and the suggestion of alternatives in design of heaters to permit the more efficient utilization of fuels other than anthracite.

Gas-making Coals: It is proposed to investigate the feasibility of utilizing Nova Scotia high sulphur coals for gas making.

Division of Ceramics And Road Materials

Ceramics: Laboratory tests on clays, shales and other raw materials of the ceramic industries and on brick and other clay products will be conducted within the limitations fixed by available staff; studies will be made to determine the cause of faults in brick and tile of Canadian manufacture and to devise methods for overcoming them, and investigation will be made of the drying properties of clays; experiments will be made on pottery bodies and glazes and on Canadian magnesite for refractory purposes.

Road Materials: The testing of samples of rock, gravel and sand, to determine their suitability for highway construction, is carried on chiefly during the winter months by the engineers who during the field season are engaged in the study of field conditions and in the collection of the samples.

Investigation is being made of the technique of the testing of road materials determining the accuracy of the various tests in use and their correlation to the life of the materials in service with the object of improving methods of testing.

RAND PRODUCTION IN MAY

The output of the Transvaal gold mines for May has been officially declared at 786,584 fine ounces, an increase of 42,933 ounces over April. As compared with May, 1922, production was greater by 156,778 ounces. Numerous individual increases are noted in the returns from the various mines, notably in the Rand mine group. Not only have larger tonnages been crushed, but mining costs have been lower. The reports of the annual meetings of the gold companies held at Johannesburg all sound the keynote of improved mining conditions on the Rand, of greater efficiency and economies, restored control, and of the prospect of effecting still further savings. Valued at 86s. an ounce, an increase of 1s. over the previous month, May's output amounted to £3,382,225, an increase of £221,708 over April and an increase of £485,210 over May, 1922.

Natives employed in the gold mines at the end of May numbered 175,591, as against 178,337 in April. The number of Europeans employed in the mines is about 18,000. On increased supply of natives for the mines is anticipated from Transkei. It has been reported, though not officially confirmed, that the conciliation board has given a majority decision adverse to the mechanics' demand for the 30 per cent. increase in wages. — Commerce Reports.

MICA DEPOSITS OF THE UNITED STATES

In a monograph of 342 pages (Bulletin 740, United States Geological Survey) D. B. Sterrett gives a complete account of the mica deposits of the United States, nearly all of which are muscovite deposits in pegmatite dikes. A little biotite has been mined. The valuable phlogopite deposits of Ontario and Quebec seem to have no parallel in the United States. But muscovite has been mined in 26 states, ranging from Maine to South Carolina, and from New York to California. While it is often whiter than phlogopite and therefore better suited for such uses as for lanterns, stoves, lamp chimneys, and lantern slide covers, its greater hardness and brittleness make it inferior to phlogopite for the manufacture of electrical motors and dynamos. The supply of phlogopite has come principally from Canada, a small amount being imported from Ceylon. In 1921 the total production of rough trimmed and cut mica in the United States was 741, 841 pounds, valued at $118,513. To this must be added 2,577 tons of scrap mica valued at $56,849, making a total value of $175,362. The total value of mica imported in the same year was $1,091,906.

The uses of mica are extending. "Ground mica is used in largely increasing quantities for the decoration of wall papers, for the manufacture of lubricants, fancy paints, rubber goods, molded mica, and roofing papers. Bran mica and coarser grades mixed with other materials furnish fireproof and heat-retaining coverings for steam pipes and boilers. In experiments made by the Grand Trunk Railway on five locomotives protected by different materials, mica covering saved about 92 per cent of the heat radiated from a bare boiler and was about twice as efficient as sectional magnesia block covering." *Tung ash* is a bronze colored material made by calcining a hydrated biotite. It has been put on the market of late years for decorative purposes.

STUDY OF MILLING PROBLEMS

Prof. E. A. Hersam, Massachusetts Institute of Technology, representing the United States Bureau of Mines, in a general study of milling problems being made in co-operation with the American Institute of Mining and Metallurgical Engineers, has made an extended tour through Ontario and Michigan for the purpose of conferring with the operators of mills and examining the work of these mills. An object of these visits has been to bring into comparison the problems which are being met in the separate mining regions where milling is practised, and to determine which problems are of common concern. A report is being prepared in which the aim will be to make what may be stated of the nature of the research in the milling industry that is being carried on, as practised upon ores, and to indicate, so far as the knowledge may be obtained or desired, the need for fundamental research, in order to solve the problems that are now presenting themselves in connection with the milling of ores, and which if solved would result in increased efficiency and the advancement of the industry.

MOTOR FUEL FROM PRICKLY PEAR

A company has been formed in South Africa to make industrial alcohol and allied products such as vinegar from the prickly pear, a cactus which is a menace to agriculture and is available in very large quantities. It is said the alcohol, to be used as a basis for motor fuel, can be made profitably to sell at 2 shillings per gallon. At present all motor spirit is imported and costs about 3s. 7d. per gallon.

The production of arsenic in Canada in 1922 amounted to 2,576 tons, valued at $321,037, which was an increase of 73 per cent. in quantity, but only 37 per cent. in value over the shipments for 1921. Approximately four-fifths of this was produced in the smelting of the silver-cobalt-nickel ores of Northern Ontario.

EMPIRE OPPORTUNITIES

Review of Certain of the Empire's Mineral Resources.

(Extracted from the "Raw Materials Review")

"Trade within the Empire" has for many years been political policy; but during and since the war it has ecome an economic necessity.

In the past, however, its extension has been hamered very considerably by lack of recognition on the art of the British manufacturers and merchants, alike f the resources of our colonies and the opportunities f increased trade which their development and conequent prosperity offers.

This survey, whilst in the main general, has aimed t being particular in instances which appear to offer eculiar opportunities for manufacturers in this country, and it has been compiled in the hope that it may e of some specific service to those who are inclined o profit by the chances which our Empire can offer of eliable and progressive supply sources.

Newfoundland's Minerals

Newfoundland, thanks, on the one hand, to the eablishment of an active High Commissioner's office in ondon, and, on the other, to the appreciation of the ossibilities of the water-power available throughout he island, may well become—given reasonable applicaion of intelligent enterprise and capital—a really imortant centre of mineral production.

The iron ore mines are the second largest in the vorld. In the early eighties Newfoundland was the ixth copper producer of the world, when three mines, mploying collectively 5,000 men, were in operation. These mines closed down in 1894 owing to the low rice of the metal (6½ c.) due to the collapse of the opper pool of that day.

On the following copper properties sufficient work as been done to warrant the hope that they may beome producers: — Goose Cove, St. Julien's, Baie Verte, Tilt Cove, Burton's Pond, Bett's Cove, Rogue's Harbour, Stocking Harbour, Naked Man, Colchester, Walsh's Cove, Shoal Arm, Little Bay Head, Little Bay, Whale's Back, Davies Pond, Lady Pond, Hall's Bay Head, Bob's Head, Island Rock Cove, near Springdale, Gull Pond, Rabbits' Arm, Sunday Cove Island, Placentia Bay, York Harbour, Chimney Cove, Gregory Cove. All these deposits, with one exception, are at tide water. Many of them have proven tonnages which would warrant operations of over one thousand tons daily; several over three thousand. The average copper content of the ore is said to be about 60 lbs. per ton. The average copper content of the ore mined on the American Continent is about 40 lbs.

Were sufficient capital applied to the well-known ore deposits it is estimated it might be possible to produce in that country a daily average equal to that now produced in the whole American Continent.

Besides iron, coal, copper, galena, manganese, molybdenite, nickel, silver, antimony, limestone, marble, gypsum, barytes, salt, petroleum, slate, clays, and infusional earth exist in commercial quantities only awaiting development.

Development in Tasmania

Tasmania has also set itself seriously to work to develop its extensive water-power resources. The hydro-electric scheme, the last section of which was opened by the Governor-General, Lord Forster, in January, develops 60,000 horse-power. A large portion of this power has been leased to the Electrolytic Zinc Co. of Australia on very moderate terms. This company has installed electrolytic works at Risdon with a capacity of producing 45,000 tons of electrolytic zinc per annum, and it is stated that the works are now working at full capacity. Another large industry supplied with electric power from this scheme is the calcium carbide plant at Electrona, while other smaller consumers of power in Hobart are being supplied from the same source.

The cost of the scheme has been great, but it is satisfactory to learn that the portion which has been in full commission has earned more than sufficient to pay the interest on the cost of its installation. It should be emphasised, however, that it is no part of the Tasmanian Government's intention to look for a large revenue from this enterprise. The primary purpose is to create new industries by the supply of electric power at the lowest possible rate. This is another proof of the sagacity of the Tasmanian authorities. Development of new industries is likely to prove a far more prolific and permanent source of revenue than could be expected from attempts to make the hydro-electric enterprise a large profit-earning one.

Projected Tasmanian Enterprises

The success which has attended this initial enterprise has given rise to the contemplation of further schemes of a like character. The water-power resources of the State have been officially surveyed and computed, and suitable sites for the power works selected. There is about 20,000 horse-power available on the Huon River at no great distance from Hobart; in the central part of the island there is 50,000 horse-power available on the River Ouse, 13,000 on the Upper Shannon River, and 30,000 on the Upper Derwent River. On the West Coast, 65,000 horse-power can be obtained from the King River, and a further 25,000 horse-power in the Lake Rolleston district. These will be developed as fast as industry seems likely to absorb the power, but it is understood that one of these sources for supplying power to Launceston will be put in hand forthwith.

From a metallurgical point of view Tasmania is also relatively well endowed. Mount Lyell copper and Mount Bischoff tin have for long occupied prominent positions in the metallurgical world. In fact, for a small State, the mineral production has been remarkable. According to the annual report of the Department of Mines for 1921, the value of the minerals won up to the end of that year amounted to £46,910,723, the principal contributing metals being — gold £7,510,481; copper, £16,118,494; tin £14,131,491; and silver-lead ore, £6,886,113. The mining of the lead-zinc deposits, which, owing to the refractory nature of the ores, has been neglected, is now likely to become an important part of the mineral industry. The treatment of these difficult ores is no longer outside the scope of modern metallurgical methods. Interesting, also, is the relative abundance of the rare metals osmium and iridium in the island. These occur and

are mined together; in 1919 the production amounted to 2,009 ozs., valued at £77,114, or about £38 per oz.

Tasmanian Coal

Coal for metallurgical purposes is sufficient, even though not present in overwhelming abundance. It is true that Tasmania can scarcely aspire to be a great steel and iron-producing State, because supplies of both coal and iron ore are moderate. There is, nevertheless, the possibility of a considerable industry of this character, particularly if cheap power is available to permit of the electric smelting of the iron ores.

Petroleum in commercial quantity has not yet been found on the island, but there is good authority for thinking it will be discovered. At any rate, there is no doubt of the abundance and richness of Tasmanian oil shale, which is already being exploited on a moderate scale.

The future of Tasmania is exceedingly promising, and it is gratifying to note in this small section of the Empire on the opposite side of the world such excellent signs of progress.

Rhodesia is another region that deserves watching and encouragement, and will repay all the attention given to it. If we permit ourselves a little of that geographical licence so natural to dwellers in so small an island, the centre of so vast an Empire, we may say that Rhodesia is next door, or fairly close to, Kenya, Tanganyika, Nyassaland, Bechuanaland, and even Basutoland. And even the briefest survey of the resources and potentialities of that widespread region opens an undreamed of vista to the imagination. Let Rhodesia suffice for the moment. We quote from the report of the Acting Secretary of Mines, to whose "chief" we may be allowed to offer our congratulations on the honour conferred on him.

Rhodesian Gold Production

The total production of gold in 1922 amounted to 652,791 ozs., valued at £3,111,468, which shows an increase over 1921 figures of 67,266 ozs., but a decrease in value of £105,807. This decrease was attributable to the fall in the premium. The amounts paid in respect of premiums on gold and silver amounted to £320,022, as against £698,395 for the previous year, representing 10.20 per cent. of the total value of the gold and silver, as compared with 21.59 per cent. for 1921. The banks continued to pay 77s. per standard ounce in the first instance, and the premium payments were adjusted later when the gold was sold in London. There were four payments of premiums made—viz., August to October, 1921, 16s. 6d; November, 1921, to January 1922, 10s.; February to April, 1922, 7s.; and May to July, 1922, 7s. per standard ounce. Taking the total gold value (including premiums) the amount of the output works out at £4.766 per fine ounce, or £4 7s. 5d. per standard ounce.

The number of gold producers was 413, which is approximately an increase of 30 per cent. over the year.

The dividends paid by the larger gold mining companies during 1922 amounted to £611,639, chief amongst these being the Globe and Phoenix Gold Mining Co., Ltd., which declared a dividend of 54.237 per cent.; Rezende, Ltd., 40 per cent.; Lonely Gold Mining Co., Ltd., 30 per cent.; and the Shamva Mines, Ltd., 27½ per cent. Rhodesia development and miscellaneous companies paid dividends during the year amounting to £256,801.

Asbestos, Chrome, Coal and Mica

The total production of asbestos for 1922 and up to date is somewhere in the region of 17,000 tons, of long fibre and good quality. For some purposes it is considered — so we are informed by a "client" of the Raw Materials Review, who, we trust, will reap some benefit from the introduction we were able to give him to Rhodesian asbestos — more suitable than the Canadian product. In any case, Canada and Rhodesia can show, for all purposes, a firm front to competition from Central Europe, so far as asbestos is concerned.

Chrome again shows a promising increase of 43,000 tons over 1921, the output being declared at 93,475 tons with a value of £302,880.

Coal also promises well for the future. The Wankie colliery is responsible for the total output for 1922—516,000 tons of good steam coal. Experts estimate the resources of the coalfield at six thousand million tons. For copper the output was 3,388 tons, value £201,022—300 tons more than in 1921. The value of copper for the year, including adjustments, amounted to £59 per ton, as compared with £65 for 1921.

In the mica output a decrease of 19 tons has to be recorded over the 1921 figures, the output being 66 tons, valued at £61,561, in 1922, as against 85 tons, valued at £20,747, for 1921. The value averaged £250 18s. 5d. per ton, which figure is, however, subject to adjustment when account sales are received. Owing to the difficulty which has been experienced by the producers in selling the mica in England, it has not yet been possible to arrive at the actual value received for the amount exported. There has been a slight revival on the fields, and increased attention is being paid to grading, and machinery has been introduced for the manufacture of punch mica. One of the mines producing a clear ruby mica has been opened up to a depth of 130 ft. and developed for a length of 500 ft. along the strike.

Tin, Arsenic and Tungsten

Only half a ton of stream tin was won from the Ranga claims in the Victoria district, valued at £61. It is hoped that the recent rise in the price of tin may be the means of producing more activity in the prospecting for tin in the country and the development of the claims already held.

Arsenic was produced in the Bulawayo and Umtali districts from two mines. The output was 497 tons, valued at £11,774, as against 361 tons and £11,263.

An amount of 45 tons (fine contents) of scheelite was declared at the end of the year from the Golden Valley Mine, in the Gatooma district, valued at £1,600. This shows a considerable increase over last year's figures. Excellent accounts are received as to the high quality of this product. Another by-product obtained from the Golden Valley Mine is red oxide, which is having a ready sale for painting purposes. It will be interesting to see how this oxide compares with the Indian red oxides, which are greatly favoured by expert users.

Minerals, however, form only a part of the resources of what we may perhaps call British East and South-East Africa. Cotton, timber, fibres, nuts, coffee, hides exist in profusion — to say nothing of cattle, dairy produce, fruits (citrus for one)—in this vast region, which surely deserves attention among those who represent Empire enterprise in this country.

THE MINING DISTRICTS

By THE JOURNAL'S CORRESPONDENTS

NOVA SCOTIA

Springhill Works and Drumheller Strikes. — For many years, Springhill miners were notorious in the Maritime Provinces; their record of striking for trivial causes was known everywhere. However, the time came when it was proved to their entire satisfaction that strikes avoided were better than strikes carried through to a finish. Therefore today, when the men of other collieries of Nova Scotia are out on strike on a mere pretext, but in reality through the manipulation of the communists, Springhill is at work, and intends to remain at work until called out by President Lewis of the International. There is no just cause for strike among the miners of Nova Scotia and when one reads that Alberta miners are on strike in sympathy there is a humorous side to the matter. The miners of the province are on strike against the use of the Provincial Police while the Drumheller men are on strike against the use of the regular forces of Canada. Cape Breton miners rather like the soldiers for in the past they found them very good fellows and are not, therefore, clamoring for their removal. They are opposed to the Provincial Police because they will not fraternize and are a very effective body.

A Communist Official Report on Sydney Labour. — The struggle in Nova Scotia is only part of the campaign now being waged by the Communists of Canada, United States and European countries. Only a short time ago a survey was made of labor by one of the Communists, whose report is most interesting and illuminating. Speaking of the miners of Cape Breton, he says "they are one hundred percent behind the Red Executive, while fifty percent of those on the Mainland also support the Reds". He admits "there are no signs of growth of the Workers Party of Canada, and that the miners while supporting a Red Executive are far behind in the political sense. This view has been held by all Communists who have visited Nova Scotia." He goes on to say that the principal efforts of the Communist leaders in the immediate future will be devoted to the organization of the Sydney steel workers, where the spirit of the union members is said to be excellent from a Communist viewpoint. He further states that he had never seen such a militant spirit amongst any miners since the days of the old Western Federation of Miners. He is confident that the "Red" leaders are in the saddle for some time, and that no wire pulling by Lewis can affect them; also that "the *Maritime Labor Herald* is improving and is regarded as a powerful weapon in the hands of capable Communists." Thus, from their own reports, none need be deceived as to the underlying cause of all the labor agitation during recent years. While there is, no doubt, some cause for the steel workers to feel aggrieved, yet it is commonly agreed that the steel workers' local, in acting against the advice of the international officers, was under the control of the Communist party. These same officers leading the local have continued to misrepresent the true conditions at the steel plant, where many union men are now at work and intend to remain so.

When Truth is Known, Communist Rule will Cease. —There is much misrepresentation of the true situation among the industrial workers of Cape Breton, due to two causes. The first is the propaganda of the Communists, who have convinced the labor organizations of Canada that the Sydney workers are maltreated and oppressed — an utter falsehood. The fact is that hundreds of Nova Scotia miners today are asking one another, "What are we striking for?" The Communist element, who forced the strike, claim to be in the ascendency today. It is unthinkable that these firebrands will remain permanently between the workmen of Cape Breton and their employers. Once let the workmen understand that they are being led by the noses into paths they know not of and the rule of the "Reds" will last no longer. The second cause is the bungling management of former strike settlements. Outsiders have interfered too much with the internal labor affairs of Nova Scotia with the result that the agitators scored a victory in each case.

The arrest of McLachlan and Livingston for a short time intensified the feeling of the miners; but that is beginning to wear off. There are thousands of moderate men who detest the action of their radical executive. There is now added dissatisfaction since in response to President J. L. Lewis' telegram, ordering the strike to be called off, Vice-President McIntyre of Local No. 26 has explained to his followers that the strike is political and not industrial. The cat is out of the bag; it is a strike for Communist rule. This justifies fully the presence of the provincial police and the military forces. It should be remembered, also, that these forces were called in, not on account of the strike, but on account of the violence of the strikers.

Reorganization of District 26 is Imminent. — The recent strike vote shows that the miners are decidedly against the strike. Out of a total of 13,000 organized mine workers in Nova Scotia only 5,500 voted on the strike ballot and of these only 3,200 voted for a strike, 2,300 being against. But the men are actually on strike, and the moderates have no leader strong enough to represent their opinion. The International headquarters recognizes this fact and is tired of the disturbed condition of the District. It is in a better position than any other trades organization in Canada to know the facts for these have been submitted to them by a Commission sent into Nova Scotia to ascertain and report on the cause of the continuous agitation. There is no doubt in the minds of those in close touch with labor affairs that a re-organization of the District must take place. That this will come when the time is ripe, is beyond doubt, for those who have followed the work of President Lewis in the United States during the last year know that he will only move when he is sure of success. This re-organization cannot come too soon. It will bring with it peace to a community goaded to the point of armed resistance by men beguiled and misled by brainless leaders.

Final statistics of copper production in the United States in 1922 show a smelter output of 950,285,947 lbs., and an average price per pound of 13.5 cents.

BRITISH COLUMBIA

Florence Mine Operations — F. R. Wolfe, president of the Florence Mining Co., states that the Florence Mine is producing at the rate of 225 tons a day and that some 150 tons of ore and concentrate are being shipped every tenth day. Two locomotives operate between the mine and the mill and 85 men are employed on the property.

Copper Bounty Stimulates Industry — L. W. Humphrey, member of the Canadian House of Commons for the District of West Kootenay, referring to the Dominion Government's action in placing a bounty of one and one-half cents a pound on Canadian copper rods and bars, said that the result would be the opening up of a British Columbia copper rod mill built at a cost of close to half a million dollars. Mr. Humphrey was speaking of the plant of the Consolidated Mining & Smelting Co. at Trail. He also said that employment would be created for from three to five hundred men and copper would be produced in Canada for which at present $3,500,000 is spent annually in the United States. Within thirty days of the coming into effect of the bounty the mill should be in operation.

Eastern Party Inspects Portland Canal Properties — Samuel L. Silverman, of New York, heads a party that left recently for the Portland Canal District. Among those with him are Malcolm Stobie, of Stobie & Furlong, Toronto, Ont.; R. B. Lamb, mining engineer of New York, advising Mr. Stobie; Major W. D. Wilson, of Hamilton, Ont.; and Judge F. H. Phippen of Toronto, Ont. Mr. Silverman is interested in the development of the "Forty-Nine" and "Bush" properties, situated in the same section as the Premier Mine, and he and his confrères intend inspecting personally these and other mining prospects.

Promising Find in Clinton District — The Whitewater Gold Fields Co. is developing the Windfall Group in the Whitewater section of the Clinton Mining Division. A gang of twelve men is drifting on what is said to be rich ore and a Ross mill is being installed. The district is being well prospected and a weekly pack train with 20 horses is providing a transportation service from Bridge River into this new and promising mining country.

Noble Five Bonded — The Noble Five Mine, Lardeau District, has been bonded by Vancouver interests and further development is planned.

Porland Canal News — The Murdock Group of eight claims on the east side of Bear River, Portland Canal District, is being prospected bythe Northern Construction Co. There are some good showings of high-grade silver-lead ore on the property. Prospectors are being advised to give some attention to this locality, which now can be reached with comparative ease over a trail newly constructed by the Government up the south bank of Surprise Creek.

The Bear River zone has come more into favor with the statement that the showings on the Dunwell Mine are improving. It is said that in the lower tunnel of the Dunwell, which has been driven 290 feet and reaches a vertical depth of 240 feet, the vein has been penetrated for 40 feet without reaching the footwall and that a large proportion of the ore is of good milling grade, while some gives high returns in silver.

Major R. F. Crichton, of Vancouver, has reached Alice Arm with a small crew of men to resume the development of the Homestake Group of claims located 26 miles up the Kitsault River. About 170 feet of tunnel work has been done, the vein having been cut at 123 feet. No. 2 Tunnel is to be exteended and other work proceeded with having in view the blocking out and proving of a considerable body of ore.

Prospective New Producer in West Kootenay — The "Iva Fern", situated on the west slope of Cultus Creek, West Kootenay, and within comparatively easy reach of Kootenay Lake, is reported to have been developed by the Standard Silver-Lead Co. with exceptionally good results. The latter company has an option and bond on the property for $100,000 which it took up after the Consolidated Mining & Smelting Co. of Canada allowed their interest to lapse. The Standard Silver-Lead continued the underground work started by the Consolidated and is reported to have opened up a large body of silver-lead-copper ore, in which there is some high-grade, while the remainder is of good milling grade. The tonnage in sight is said to be increasing daily and the Company is believed to have established another important Kootenay producer. The construction of a wharf by the Dominion Government on the lake side is being sought. Further road work is asked and plans are being discussed for the installation of a concentrator and a compressor plant.

Trail Ore Receipts — Ore receipts at the Trail Smelter, Consolidated Mining & Smelting Co., from June 22nd to 30th inclusive, totalled 13,241 tons. The shippers, including some of the notable contributions of the first days of July, follow: Hercules, Burke, Idaho, 133 tons; Alamo, Alamo, 43; Bell, Beaverdell, 35; Company Mines, 11,828; Emerald, Salmo, 39; Knob Hill, Republic Wn., 104; Lone Pine, Republic Wn., 385; Quilp, Republic Wn., 419; Rosebury-Surprise, New Denver, 52; Silversmith, Sandon, 165; and Victor, Three Forks, 32.

The Late R. G. Edwards Leckie and Windpass — General R. G. Edwards Leckie, a mining engineer of prominence in Western Canada who had an exceptional overseas record in connection with the Canadian forces in the Great War, died recently in Vancouver, his home city. His sudden death is mourned by the community to which he belonged and is keenly regretted throughout the Province. This applies particularly to mining men, as all engaged in that business in British Columbia were acquainted with General Leckie. Latterly he had been engaged in putting the Windpass Mine at Chu Chua upon a producing basis. Through his efforts Messrs. Trites, Wood and Wilson, of Fernie, who made fortunes through their interests in the Premier Mine, have been assisting in the financing of the Windpass. Mining machinery has been installed and camp buildings erected. It is stated that the Windpass now is an assured mine and it is believed that its success will lead to the opening of other properties in the district.

HYDROGEN SULPHIDE AN ACTIVE POISON

That hydrogen sulphide, a gas often present in mines and tunnels and in various industrial plants, is an extremely poisonous gas, although not heretofore fully recognized as such, is disclosed by an investigation just completed at the Pittsburgh experiment station of the United States Bureau of Mines, and described in Serial 2491. The investigation establishes the fact that acute poisoning of men can be produced by low concentrations of this gas and may result in respiratory paralysis followed by heart failure and death.

Hydrogen sulphide is sometimes present in mines, railroad tunnels, sewers, and marshes; and is found in various stages of the manufacture of sulphuric acid

nd in the distillation of petroleum, particularly those ils known as high-sulphur crudes; also about some as wells, gas plants, and smelters.

FALL MEETING OF ELECTROCHEMICAL SOCIETY

The next meeting of the American Electrochemical Society is to be held in Dayton, Ohio, on September 27th to 29th. The papers will include a symposium on "Recent Progress in Electrolytic Refining," under the chairmanship of F. R. Pyne, of the United States Metals Refining Co. There will be an innovation, consisting of round table discussions of electric furnace brass foundry practice, organic electrochemistry, chlorine and electroplating. Visits will be made to local plants.

A legal minimum wage above that fixed by economic conditions signifies that the recipients are relieved to a certain extent from the struggle for existence that is the natural lot of all living beings. When this minimum wage does not exceed the literal "living wage", its existence would seem to be justified. If it is above what is required to support life decently, its justice is doubtful.

The Messina copper mine in Rhodesia is again in operation. It was closed down in 1921, due to the low price of copper. Its capacity is 300 tons of copper a month. The destiny of an important part of Rhodesia's prospective railway system is linked up with the success of this mine.

Advertisements other than "Employment Wanted" or "Employees Wanted" will be inserted in this department at the rate of 20 cents per agate line (14 agate lines make one inch). $2.80 per inch, each insertion, payable in advance. Space measured from rule to rule. When four or more consecutive insertions of the same advertisement are ordered a discount of 25 per cent. will be allowed.

Advertisements of "Wanted Employment" or "Wanted Employees" will be inserted at the rate of two cents a word, net. Cash must accompany order. If box number is used, enclose ten cents extra for postage in forwarding replies. Minimum charge 50 cents.

FOR SALE

Gold property in Nova Scotia. Wide mineralized belt, 6 dwt. Recent shipment to Nova Scotia Technical College from seven-foot vein ran $18.00 per ton. Will sell, or will give interest to party willing to develop property and erect mill. Inspection invited. Particulars on request.
— PERCY WHITE, Stellarton, Nova Scotia.

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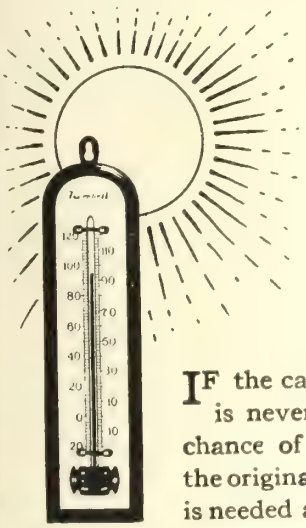

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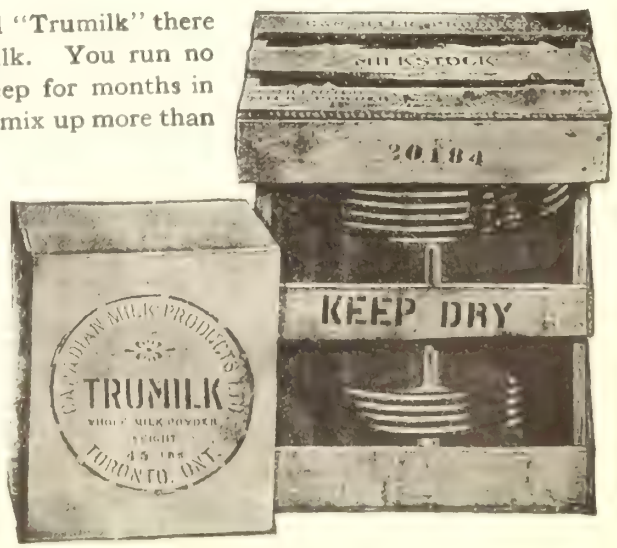

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MINES BRANCH

Recent Publications

Talc and Soapstone in Canada, by H. S. Spence.

Titanium, by A. H. A. Robinson.

Summary Report of Investigations made by the Mines Branch during the calendar year ending Dec. 31, 1921.

Phosphate in Canada, by H. S. Spence.

The Preparation, Transportation and Combustion of Powdered Coal, by John Blizard.

Road Materials along the St. Lawrence River, from Quebec Boundary to Cardinal, Ont., by R. H. Picher.

Barium and Strontium in Canada, by H. S. Spence.

The Coal-fields and Coal Industry of Eastern Canada, by F. W. Gray.

Analyses of Canadian Fuels. Part I to V, by E. Stanfield M. Sc., and J. H. H. Nicolls, M. Sc.

Graphite, by H. S. Spence.

Gas Producer Trials with Alberta Coals, by J. Blizard and E. S. Malloch.

The Mines Branch maintains the following laboratories in which investigations are made with a view to assisting in the developing of the general mining industry of Canada:—

Fuel Testing Laboratory.—Testing value of Canadian fuels for steam raising and production of power gas; analyses, and other chemical and physical examinations of solid, liquid and gaseous fuels are also made.

Ore-Dressing Laboratory.—Testing of Canadian ores and minerals, to ascertain most economical methods of treatment.

Chemical Laboratory — Analyzing and assaying of all mineral substances and their manufactured products. Copies of schedules of fees, which are slightly in excess of those charged by private practitioners, may be had on application.

Ceramic Laboratory.—Equipment is such that complete physical tests on clays and shales of the Dominion can be made, to determine their value from an economic standpoint.

Structural Materials Laboratory.—Experimental work on sands, cements and limes is also undertaken.

Applications for reports and particulars relative to having investigations made in the several laboratories should be addressed to **The Director, Mines Branch, Department of Mines, Ottawa.**

GEOLOGICAL SURVEY

Recent Publications

Memoir 108. The Mackenzie River Basin, by Charles Camsell and Wyatt Malcolm.

Memoir 127. Beauceville map-area, Quebec, by B. R. MacKay.

Memoir 128. Winnipegosis and Upper Whitemouth River areas, Manitoba, Pleistocene and Recent deposits, by W. A. Johnston.

Memoir 129. Geology of the Moncton map area, by W. J Wright.

Memoir 130. Geology and mineral deposits of the Bridge River map-area, British Columbia, by W. S. McCann

Memoir 131. Kenogami, Round and Larder Lake areas,

Memoir 132. Geology and ore deposits of Salmon River district, British Columbia, by S. J. Schofield and G. Hanson.

Memoir 133. The southern part of the Sydney coal field, Nova Scotia, by A. O. Hayes and W. A. Bell.

Map 68A. Moncton, New Brunswick. Geology.

Map 155A. Portions of the districts of Algoma, Sudbury and Timiskaming, Ontario. Geology.

May 1585. Mackenzie River basin, 1922 edition. Geology.

Map 1751. Wainwright, Alberta. Topography.

Map 1752. Monitor, Alberta and Saskatchewan. Topography.

May 1767. Sydney, Nova Scotia. Geology.

Map 1830. Vermilion; townships 47 to 55, ranges 5 to 10, west of the fourth meridian. Topography.

May 1831. Vegreville; townships 47 to 55, ranges 11 to 16 west of the 4th meridian, Alberta. Topography.

May 1860. Keno Hill area, Mayo district, Yukon. Geology.

May 1948. Wanapitei Lake area, Ont. Geology.

May 1964. Brockville-Mallorytown area, Leeds county, Ontario. Geology.

May 1965. Fraser River delta, British Columbia, Geloogy.

May 1972. Michipicoten area, Ontario. Geology.

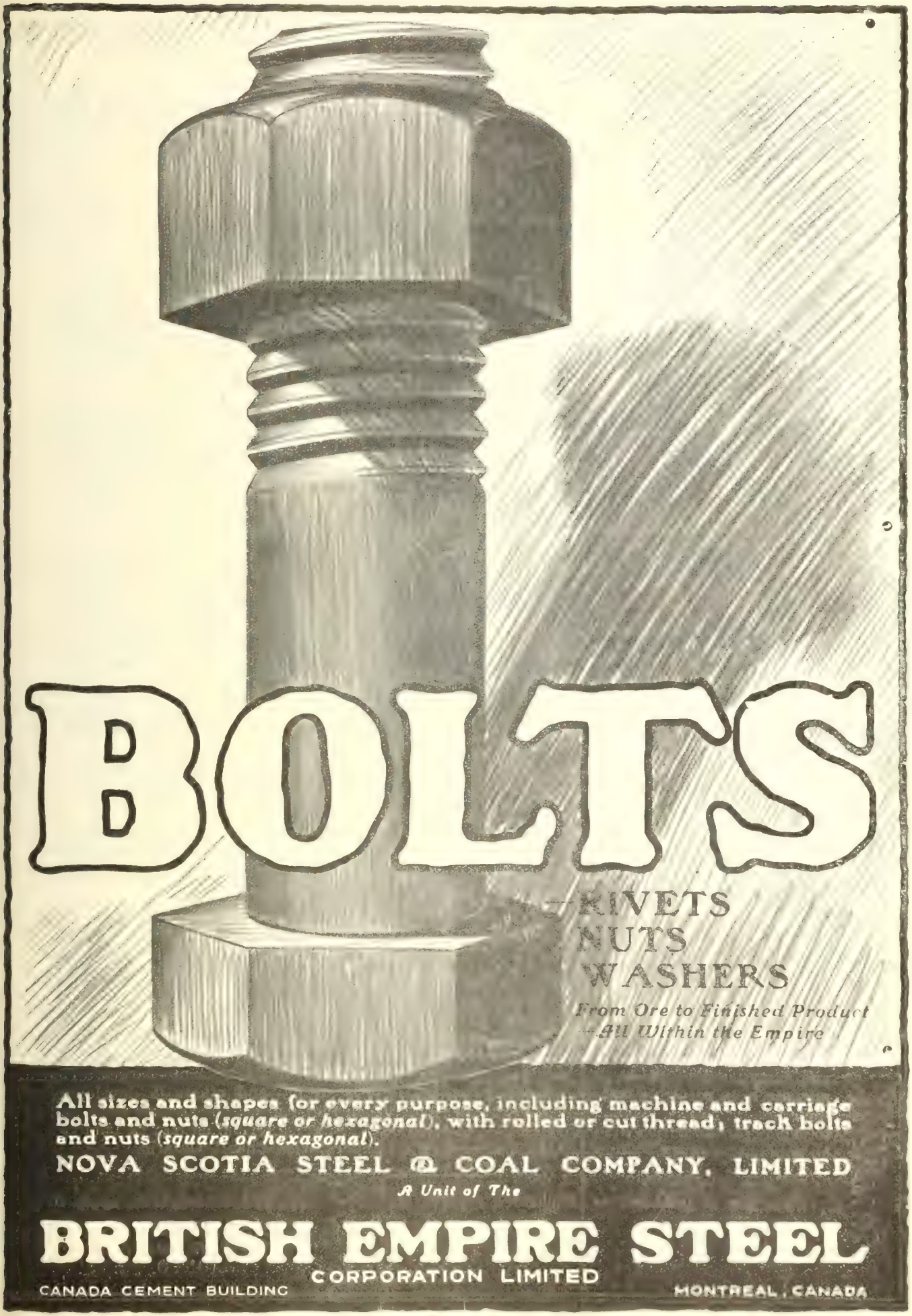
May 1977. Mackenzie river between Norman and Beaver river, district of Mackenzie. Geology.

Applicants for publications not listed above should mention the precise area concerning which information is desired.

Summary Report. The annual Summary Report of the Geological Survey is now printed in parts. Applicants should, therefore, state what particular geologist's report is required, or what subject they are interested in.

The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon.

Communications should be addressed to **The Director, Geological Survey, Ottawa.**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Ontario's Minerals

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DEPARTMENT OF MINES

Hon. H. MILLS, Minister of Mines

Mineral Areas.

Ontario, with its 407,262 square miles, contains many millions of acres in which the geological formations are favorable for the occurrence of minerals, 70 per cent of the area being underlain by rocks of pre-Cambrian age. The phenomenally rich silver mines of Cobalt occur in these rocks; so also do the far-famed nickel-copper deposits of Sudbury, the gold of Porcupine and Kirkland Lake, and the iron ore of Magpie and Moose Mountain mines.

Economic Minerals.

In addition to the above, practically all economic minerals (coal and tin excepted) are found in Ontario:—actinolite, apatite, arsenic, asbestos, cobalt, corundum, feldspar, fluorspar, graphite, gypsum, iron pyrites, lead, mica, molybdenite, natural gas, palladium, petroleum, platinum, quartz, salt, talc and zinc. This Province has the largest deposits on the continent of talc, feldspar, mica and graphite.

Building materials, such as ornamental marble, limestone, sandstone, granite, trap, sand and gravel, lime, Portland cement, brick and tile, meet every demand.

Mineral Production.

Preliminary returns show the output of the mines and metallurgical works of the Province for the year 1921 to be worth $48,128,387,of which the metallic production was $27,574,202.

The following figures show the rapid growth of Ontario's mineral industry by five-year periods since 1891:

Year.	Value.	Year.	Value.
1891	$4,705,672	1906	$22,388,383
1896	5,235,003	1911	41,976,797
1901	11,831,086	1916	65,303,822

Dividends.

Dividends and bonuses paid to the end of 1921 amounted to $23,140,734 for gold mining companies, and $84,388,185 for silver mining companies or a total of $107,528,919.

Mining Regulations.

A miner's license costs $5.00 per annum, and entitles the holder to stake out in any or every mining division three claims of 40 acres each. After performing 200 days' assessment work on a claim, patent may be obtained from the Crown on payment of $2.50 or $3.00 par acre, depending on location in unsurveyed or surveyed territory.

Assay Office.

The Provincial Assay Office at No. 5 Queen's Park, Toronto, is maintained by the Department of Mines for the free identification of minerals, free assays under the provisions of the Mining Act of Ontario, and also for general assay work as per the Schedule of Charges which may be obtained on application.

Temiskaming Testing Laboratories

The Department maintains, at Cobalt, an ore sampling and testing laboratory which is now prepared to receive parcels of gold ore from 100 pounds upward, and after sampling and assaying the same to pay to the shipper the value thereof, less treatment charges. The purpose is to afford a market for ores extracted by prospectors and others in developing their mining claims, enabling them to obtain funds which they can use for further work and to report on the most satisfactory method of treatment. Fuller information may be obtained on application to the Manager, Temiskaming Testing Laboratories, Cobalt, Ontario.

Publications.

For list of publications, illustrated reports, geological maps and mining laws, apply to

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Winnipeg, Man., Union Station.
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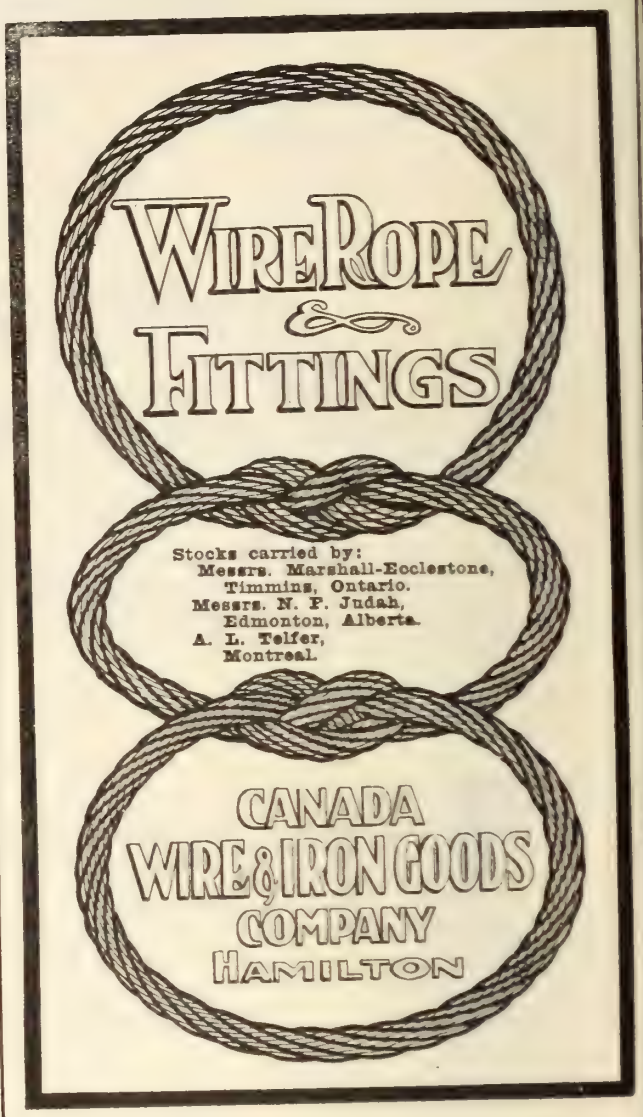
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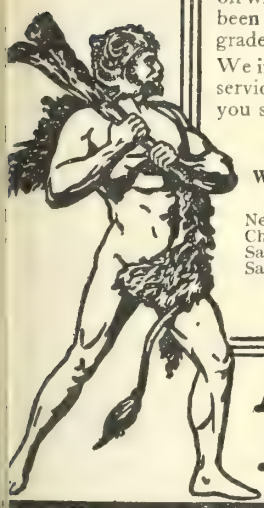

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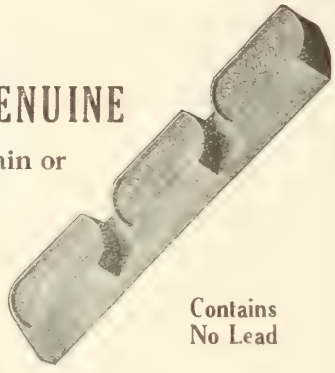

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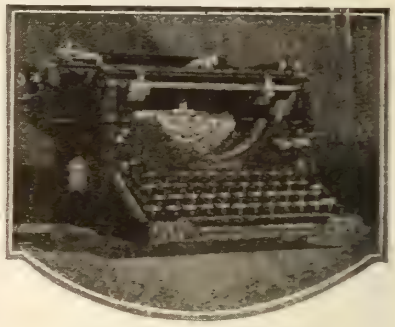

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Electric Hoists:
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Elevators:
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Engines — Steam:
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Ferrier, W. F.
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Exhauster:
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Manganese Steel, See Steel, Manganese:
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Mica:
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Canadian Mead-Morrison Co.
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Ore Sacks:
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Mine & Smelter Supply Co.
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Piston Rock Drill—see Drills, Air Hammer:

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Herbert, Alfred, Limited.
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Pumps-Turbines:
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Pumps-Vacuum:
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Smart-Turner Machine Co.
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Pumps — Boiler Feed:
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Laurie & Lamb.
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Pumps — Diaphragm:
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Pumps — Electric:
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Laurie & Lamb.
Peacock Brothers, Ltd.
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Pumps — Sand & Slime:
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Mine & Smelter Supply Co
Smart-Turner Machine Co.
Sylvester Mfg Co Ltd

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Peacock Brothers, Ltd.

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Sylvester Mfg. Co

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Denver Rock Drill Mfg. Co., Ltd.
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Hull Iron & Steel Foundries, Ltd.
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Holman Bros. Ltd.
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Jones & Glassco, Regd.

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Silent & Steel Roller—See Roller Silent Steel.

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Sintering:
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Smelters:
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Hendrick Mfg.
Horton Steel
Ontario Wind
Pacific Coast

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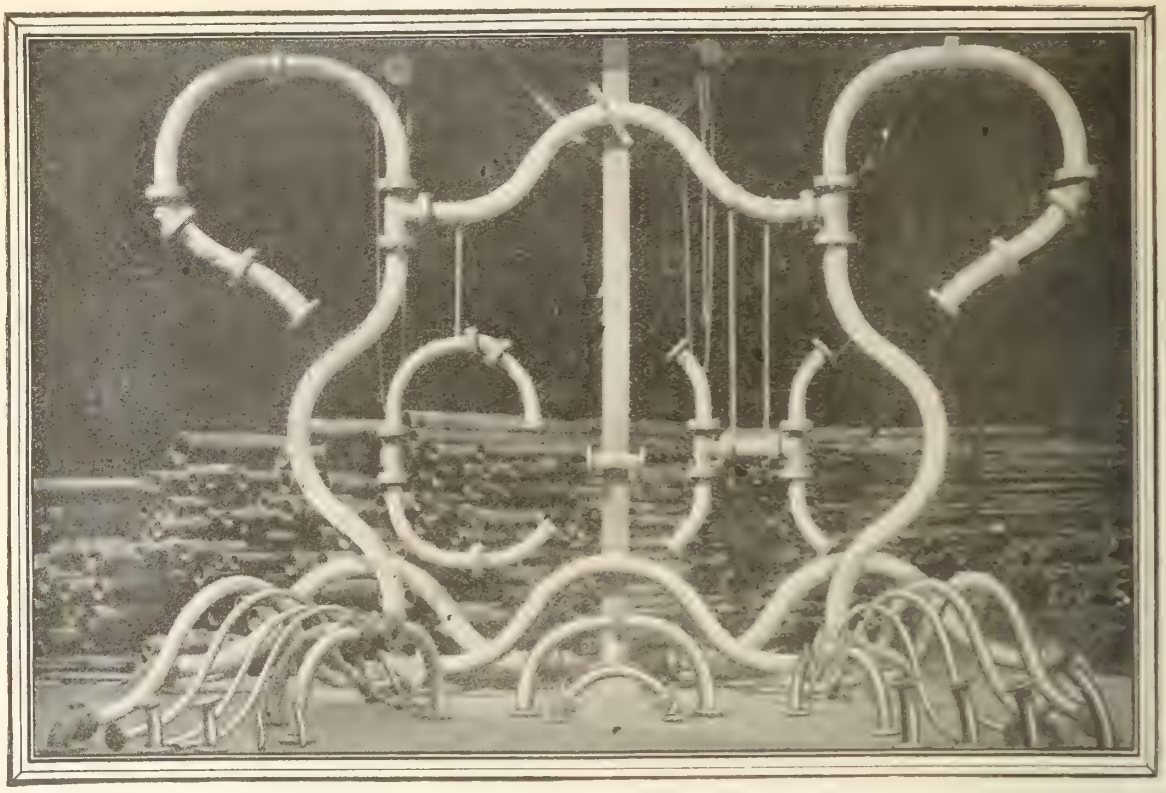

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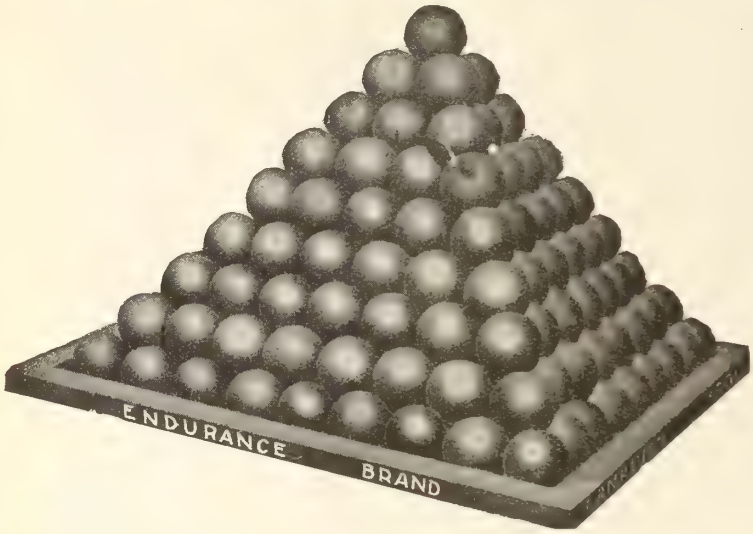

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The holder of the certificate may stake mining claims to the extent of 200 acres

WORKING CONDITIONS. During the first six months following the staking of the claim, work on it must be performed to the extent of at least twenty-five days of eight hours.

SIX MONTHS AFTER STAKING. At the expiration of six months from the date of the staking, the prospector, to retain his rights, must take out a mining license.

MINING LICENSE. The mining license may cover 40 to 200 acres in unsurveyed territory. The price of this license is Fifty Cents an acre per year, and a fee of $10.00 on issue. It is valid for one year and is renewable on the same terms. on producing an affidavit that during the year work has been performed to the extent of at least twenty-five days' labour on each forty acres.

MINING CONCESSION. Notwithstanding the above, a mining concession may be acquired at any time at the rate of $5 an acre for SUPERIOR METALS, and $3 an acre for INFERIOR MINERALS.

The attention of prospectors is especially called to the territory in the North-Western part of the Province of Quebec north of the height of land, where important mineralized belts are known to exist.

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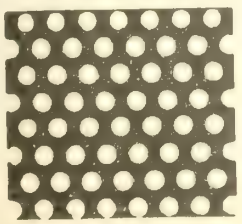

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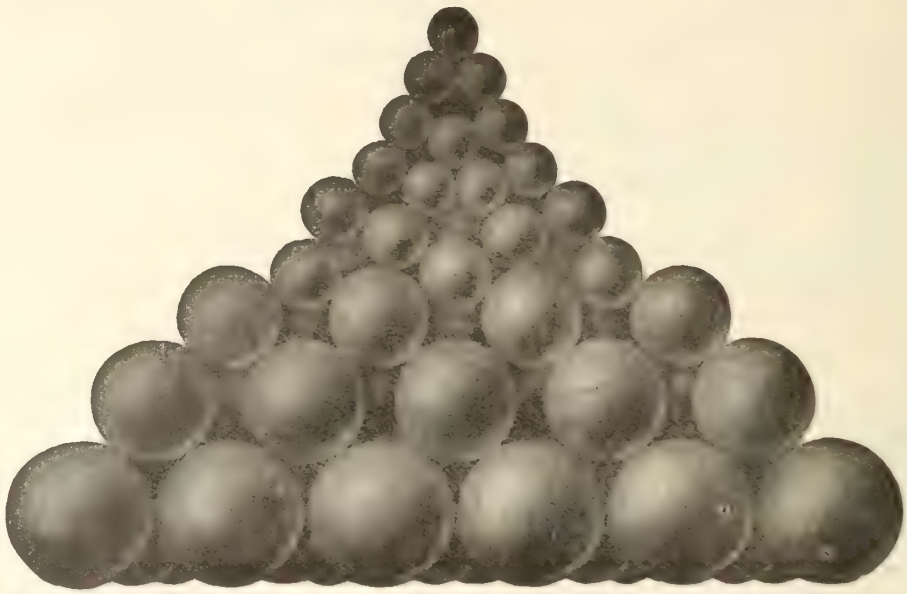

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PUBLISHED WEEKLY

Devoted to the Science and Practice of Mining, Metallurgy and the Allied Industries; and more particularly to their progress in Canada

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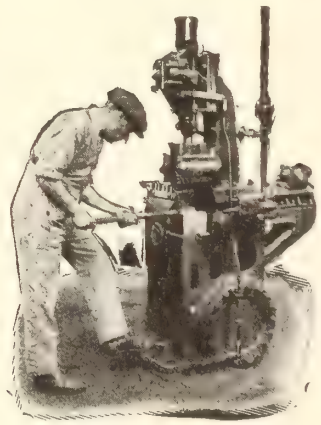

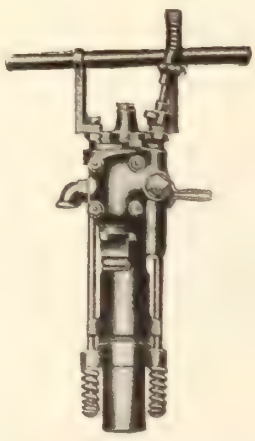

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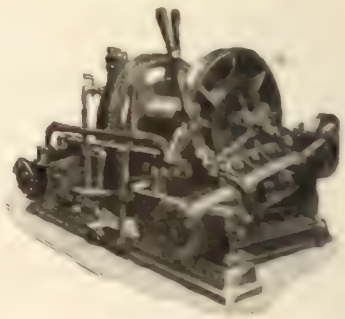

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:-: EDITORIAL :-:

BETTER TIMES AHEAD FOR NOVA SCOTIA

The intervention of John L. Lewis, President of the United Mine Workers of America, in the Nova Scotia coal miners' strike has virtually settled it. Mr. Lewis' public denunciation of the tactics and aims of the insurgent labour leaders in Cape Breton is nothing if not direct and vigorous, and is reminiscent of his method of combatting the claims of employers when he has been in conflict with them. The "moderates" are in the saddle once more, and after their sad experience under Communist control, it seems probable that sounder policies and saner action will now become the order of the day.

Among the first of the striking locals to return to work was Caledonia, which made its decision last Thursday. It is significant that the first of the signatures appended to the resolution recommending similar action to the other locals is that of Robert Baxter, President of District 26, U. M. W. A., until the incidence of "Red" rule last year. It will be recollected that, on being turned out of office by the extremist vote, Robert Baxter returned to his former occupation as a miner, which he still pursues. The Baxter régime was not notable for any dearth of excitement in the way of strikes; but there was no hint of Communist rule in the action of his executive, the strikes being conducted with due regard to the accepted "rules of the game," with the sole object of bettering the daily lot of the mine workers.

Silby Barrett, formerly the representative of District 26 on the International Board in Indianapolis, is now the leader of the union in that district. At the time of writing it appears that he will be accepted by all the locals, even if not universally acceptable. He has shown himself a good friend of the miners, and an outspoken enemy of the extremists. He has the full confidence of the international executive of the miners' union, and is backed by the officials of the British Empire Steel Corporation. Altogether, he begins his term as leader with a record and under auspices that promise sound and effective administration.

The leaders of the extremist group have taught their followers to "bore from within:" It is this insidious policy that brought them into power in their union last year. The miners now have seen whither the prophets and the policies of Communism would lead them. We would judge that they have marked well the result, and that the "boring" tactics will have little effect from now on.

There is no doubt that the workers in the collieries and steel plants of Cape Breton have now, as heretofore, some just cause for complaint against their employers, the British Empire Steel Corporation. Since its inception, part at least of the management of the Corporation have shown a disposition to close the breach between their workmen and themselves, which, from small beginnings, has grown to alarming proportions during recent years. They could not, however, treat successfully with labour leaders who did not recognize honour and fair play any more than they did the laws of the land. Now that reason has been reinstated among the workmen, we shall look to them to meet the management of the British Empire Steel Corporation half way in the effort to make collieries and mills the centre of a prosperous community, and to make Nova Scotia bulk large in the iron and steel industry of the world.

THE A. I. M. M. E. EXCURSION

Four weeks from today the summer excursion of the American Institute of Mining and Metallurgical Engineers will be in progress through the mining districts of Northern Ontario, with Quebec still ahead. It will be an important occasion for the mining camps visited, and an interesting occasion, we are confident, for the visiting miners and metallurgists. The unique nickel field at Sudbury, the outstanding silver camp at and about Cobalt, the gold district further north that already holds the interest of mining men and investors in many countries, and the famous Quebec asbestos region — all these will be fruitful subjects of investigation as the tour proceeds. In each camp arrangements are in progress, not only to entertain the excursionists, but to hold a technical session discussing the local geology, mining and metallurgy that will be worthy of each of these prominent mining centres. These arrangements are in the hands of local committees.

For this occasion the *Canadian Mining Journal* has enlisted the aid of a number of prominent Canadians connected with the mineral industry in preparing a special number designed to aid the visitors in their studies of our mines and methods. The object has been to supplement the information and ideas that will comprise the technical sessions at the various mining centres, and to draw attention to, and stimulate discussion of, points that otherwise might be overlooked, as well as to present, from competent au-

thorities, summary accounts of the mineral areas. This number of the *Journal* will be issued on August 17th, and will be placed in the hands of the excursionists on their arrival in Toronto on August 20th.

The Canadian mining fraternity will welcome the visitors not as strangers or foreigners, but as acquaintances and friends. In spite of the international boundary, the fortunes of mining men on both sides are closely connected, and there has been, to an extent that few of us realize, an interchange of technically trained personnel in the mining and smelting centres. Thus the present excursion will serve, not only to inform our confrères from the United States about the facts of our present mining industry and our hopes for the future, but also to provide additional reason for the feeling of good-will for which our international relations already are notable.

A PROBLEM FOR MINERS

Periodically we point, in these pages, to the fact that the mining industry must be the pioneer to open up a large part of the unsettled portions of Canada. We have evidence round about every established mining camp or colliery district of the close inter-relation of mining, settlement and industry in general. At Timmins, Ontario, we find a town of 12,000 inhabitants that has grown with the two great gold mines, Hollinger and McIntyre, and a surrounding settlement on the land that will extend for many years to come. So long as the mines last, the townspeople are assured of occupation and the farmers in the surrounding countryside are provided with a market more than ordinarily profitable. The farms will, in the long run, produce more material for human consumption than the mines; but their settlement has been induced in the first place by the working of the deposit found by the prospector in the midst of the forest, far from the railway.

The point we wish to remark particularly today is that, to a very large extent, it is up to the mining men of Canada to solve the vexed problems of immigration, of a national railway system that causes a huge annual deficit, and of a national budget that allows our national debt to soar to a dizzy height.

Consider immigration. While we discuss coaxing a few thousand Britishers to our shores, the United States has to put down the bars against Britishers, the monthly quota having been filled. Our climate does not frighten these people. We can offer them cheaper and better land. We cannot offer them so good a chance of making a living. Our own people are swarming across the border, because "times are good" there while things are dull on this side. If we had the right conditions here, Canada would draw the crowd instead of her neighbor.

We would judge that the development of the mining industry offers the surest, soundest and most rapid means of inducing the development and settlement of our country. Unfortunately for our fertile prairie land, the new gold field will provide a market far removed; but the Great Clay Belt of Ontario and Quebec, more difficult of settlement, will reap a substantial benefit from the mines along its southern border. Once cleared and established in production, this northern area will rival the more southernly areas in Ontario and Quebec, and the trunk lines of railway that intersect it, supplied with a network of "feeders," will be an asset to the national exchequer.

In a number of other localities throughout Canada, similar examples are to be found. In each case the first move is up to the prospector and the miner. We cannot hope for a mineral development either on the scale or with the rapidity of that which peopled the United States in such short order. But we can and must find and put to use our mineral treasures so as to keep our young men employed profitably at home, attract more people to our shores, and provide good markets for our farmers and manufacturers, thus to build up a well-rounded prosperous, and, as nearly as possible, self-contained national community.

"PLATINUM ASSAYS AND PLATINUM PROMOTIONS"

This is the title of a report (serial number 2496) just issued by the Bureau of Mines in Washington. Its stated purpose is to warn the public against mine promotions based upon assay returns that are either honestly mistaken or deliberately falsified. Forty four samples from various states were examined. One was found to contain platinum sponge, and another platinum foil and wire — obviously salted. The assayer's name, where available, is given in each, with the amount of platinum he reports. In no case was platinum found in these samples, apart from those obviously salted. The report includes as well a direct warning to the public against any promotion based upon reported platinum deposits in the United States; the search stimulated by the needs of the war period failed to reveal any appreciable natural resources of platinum in the United States.

This unequivocal and forceful official statement from the Bureau of Mines is, evidently, part of the determined and concerted effort of public officials in the United States to check the issuance of fake stocks, particularly mining stocks, whereby the public are mulcted of millions of dollars annually. It is principally by means of the public mails and through the pages of newspapers licensed to serve the public that the stock-jobbers do their dirty work. It is extremely difficult to draw a hard and fast line between legitimate speculation on the one hand and wild and dishonest schemes on the other; yet it is not at all difficult to class certain promotions in the latter class.

The Bureau of Mines in Washington has now undertaken what we hope will become firmly established as a custom, not only in the United States, but in Canada. Genuine mining authorities, in both countries, are far too chary about exposing and denouncing publicly the unwise or dishonest ventures that, assuming the name of mining, come within their notice. Public authorities, in particular, by virtue of their position in the public service, are under obligation to aid and to educate. On occasion our Canadian Departments and Bureaux of Mines have been outspoken about such frauds or ill-conceived undertakings. We look forward to the time when they will range themselves more actively on the side of those who would abate the present nuisance and wastage of capital.

HYDRO-ELECTRIC POWER AND MINING

The natural resource in Canada that is receiving most attention today is water-power. Its development is in the hands of a group of engineers and financiers who are making the most of a wonderful opportunity. Hydro-electric power is being developed not only to meet the present needs of industry and of urban communities, but is also being provided as an inducement for the establishing of new industries. By virtue, to a large extent, of cheap power, a number of localities in Ontario and Quebec have become veritable hives of industry, and eastern Canada promises to become one of the world's important industrial centres.

At some time in the not distant future, those interested in the development of hydro-electric power will find themselves searching for opportunities for its further use. At present markets for power are not so difficult to find, and even when not ready-made, there are many cases in which such markets can be created by means of a little well-applied effort. Within a measurable term of years the market for electric power will have become saturated. Then will come an opportunity for the mineral industry. Mines themselves consume comparatively little power; but to work up certain minerals into merchantable form, enormous quantities of electric power can be used profitably. Already electrolysis, electrothermic reduction and electric furnace refining are responsible for a large part of Canada's finished mineral products. Calcium carbide and acetylene, and the acetic acid and other products derived from it; artificial abrasives; high-grade alloy steels; refined nickel, copper and zinc; ferro-alloys; artificial graphite — these are a few of the important industrial materials already made from minerals by aid of the electric current. Their number is increasing constantly, and electro-metallurgy and electro-chemistry offer fields for research whose importance is vast, but difficult to gauge. The newest of the branches of chemistry and metallurgy, they have made wonderful strides during recent years, with promise of continuous and still greater advances in the future.

Those interested in the mineral industry and those others interested in hydro-electric power should "get together" more closely, for their mutual benefit. At present there is no close *liaison* between the two groups. The miner searches for markets for the raw materials he produces, and the producer of hydro-electric power looks for wheels to turn or furnaces to heat. Between them is a gap, to be bridged by the metallurgist and the chemist, and most of all by the researcher in applied chemistry .

This is a problem of today, as well as of tomorrow. It is worth the attention of the best technical men and the keenest business men of both the mineral and the water-power industries.

COBALT OLD AND NEW

Here once of old the bears plunged through the brake,
(Plunging, and then the break, show still they're here.)
And moose and caribou their haunts did make.
(Here many still find fortune hunting dear.)

Here once red Indians did their camp-fires strike,
(To-day each new-made strike fires all the camp.)
And on the warpath, seeking gore, they'd hike.
(Now, seeking ore, what throngs their footprints tramp!)

Coureurs des bois deep-laden plowed the drifts,
(In drifts to-day with other lodes men vie.)
The rare furs, bringing, fit for kingly gifts.
(Here also now at times the fur doth fly!)

Here soldiers of the king wrought valiant deed,
(All deeds here now are with suspicion viewed.)
For which to some were titles well decreed.
(O'er title now what peck of trouble brewed!)

Chill, bleak this land — Our Lady of the Snows,
("Cold feet" and "frosts," now's lacking neither thing.)
"A nipping and an eager air" here blows.
(And nipped are many by this Nip I sing!)

(Editor's note. — The above verses, which circulated through the press in 1907, the first boom year at Cobalt, apply as well today, with the exception of the last phrase. Many will remember the wild gyrations of various of the Cobalt stocks on the markets, said to be due to the manipulation of "insiders" — a custom not yet obsolete. However, if we change the name in the verse, we spoil the rhyme; so it is best to let it stand as a monument to the departed glory (market-wise) of Canada's greatest silver mine.)

THE USE OF ELECTRICITY IN COAL MINES

By JAMES A. ERSKINE*

During the past forty years, no department of science has made greater progress than that concerned with electricity and magnetism. The use of electric light and power in mines has caused a most astonishing change in the mining industry. In the year 1880 the first arc lamps that were employed for regular work at any colliery, and the first electric light of any kind underground, were installed at the Mardy and Cymmer Collieries in England. The first use of electric power in mines was at the Trafalgar Colliery in Forest of Dean, England, in 1883, where it was installed for driving a pump. Thirty years ago there were only four electric power installations in the mines of Britain, and at that time only forty-two collieries had adopted electric light. Of this number twenty were in South Wales, seven in Staffordshire, four in Derbyshire, five in Lancashire, and six in the North of England.

Looking back at those days one wonders at the audacity with which electrical engineers undertook all manner of work, and generally carried it through with a fair measure of success.

An Early Installation

My first experience of mining electrical plant occurred when, as an apprentice, I was sent with an electrical engineer to report on a lighting plant at a colliery. When we arrived at the colliery we found the electrician, or rather the man-in-charge, and were shown two Gramme machines. The tension on the brushes was obtained by a number of bolts, nuts and washers hanging by a piece of string. The machines were simply covered with candle grease. Having asked the cause, we were told that candles were used to give light for starting up. It was noticed there were no lamps in the engine-house, and on asking how they managed after starting, we were informed that these were not necessary, as there was plenty of light from the brushes. After starting up, it could be seen that the statement was quite correct. The mistake in the early days was that the apparatus installed was quite unsuitable for mining conditions. The intention was to make the mine suit the apparatus, instead of the apparatus to suit the conditions of the mine.

However things gradually improved until there were some excellent direct current plants in mines working at 500 volts. Then three-phase current was introduced into mining, and with the installation of these up-to-date plants, the colliery managers began to acquire a knowledge of electrical engineering. But the new motive power and its peculiarities played many pranks during the practical training of some of these men.

A few years ago a young electrical engineer was in charge of a three-phase plant at a colliery. He was obliged to go away one day on business, and that morning about nine o'clock his assistant told the manager that he would have to switch the current off a certain district as there was a "ground" there. The manager exclaimed, "A 'ground' on first thing this morning! Why didn't you arrange to put it on yesterday after the pit finished?". However, practically every colliery in England today has an electric plant, and what a change it has made.

* Electrical Engineer, Dominion Coal Company, Sydney.

Features of Modern Installations

The old belt-driven generator and slow-speed horizontal engine have been replaced by direct-coupled sets, and these in turn are being replaced by turbo-generators of larger size. Another striking feature is the steady increase of pressure. From 500 volts the pressure was raised to 2,000 volts, then to 3,000 volts, and current at this pressure is now taken right into the mine, and transmission lines of 6,000 and 11,000 volts are quite common. To-day some of the colliery electrical plants are equal in extent and perfection to the power stations of our large cities. Enormous strides have been made in the application of electricity underground for pumping, hauling, coal-cutting, conveying, etc. There are many mines where it would be commercially impossible to pump by any other means. Electrical haulages up to several hundred horse-power are now quite common, and small portable haulages are largely dispensing with horses underground.

It is a mistake, however, to put electricity in places underground where the conditions are unsuitable, and this applies particularly, I believe, to coal-cutters. It must not, however, be imagined that electric coal-cutters installed on old collieries will revolutionise them instantaneously. To get results the workings must be laid out on a plan to suit machinery. More coal-cutter failures have resulted from lack of adequate haulage capacity, insufficient ventilation, inadequate supply of power, want of organization in carrying on the work, want of study of roof conditions and other causes, than from defects in the machines themselves. It is here that the mining and electrical engineers must co-operate, each studying the situation from the other's point of view, and by both applying their minds to the work, make the application of machinery a success. Further, having installed the plant and having made all necessary arrangements, the results must be followed up, daily records kept, haulage arrangements made perfect, and an analysis made of all interruptions or sources of delay. This organization must be maintained or disappointment will result.

Good Opening for Further Electrification

There is an all-important factor still to be mentioned, the need of brains — the faculty of imagination, of intelligence applied to industrial problems, and the conception of new ideas. No branch of engineering gives greater scope to man's inventive genius than electricity. It is still in its infancy, although tremendous strides are being made. There is plenty of scope in the mining industry for the exercise of ingenuity and intellect, not only by purely mining men, but also by electrical and other engineers, for there are many unsolved problems in mining.

As to the mining industry itself, a much discussed question always arises as to how we are to improve upon the unsatisfactory position with respect to output per person employed. Those engaged in the electrical industry will be interested to know that one of the most fruitful means by which increased production can be attained is by the greater use of power; and likewise

that electricity is admittedly the most convenient and economical means of transmitting and applying the power so much required.

There is no doubt that the amount of electric power employed per unit of labor in most coal mining districts is much less than it should be. This is at present being brought gradually to a higher standard. In Cape Breton, one example of this is the electrifying on an extensive scale of some of the Dominion Coal Company's collieries at Glace Bay. Those engaged in the electrical industry, therefore, need have no hesitation in preparing for a largely increased demand for electrical plant of all kinds, and in particular electrical manufacturers and engineers are well warranted in considering the needs of the coal mining industry.

Makers of mining appliances will require to have mining specialists whose experience and training in mining conditions qualify them to advise mining engineers on the problems that confront themi. All that is best in mining machinery in other countries must be studied and borrowed for our use. There will be a great demand for all classes of labour-saving devices tending to cheapen the cost of removing the coal from its bed, and placing it in cars at the pit-head.

The Need for Study and Research

In conclusion I should like to add that every mining concern, however small, should have on its staff men fitted by experience and training and gifted with imagination to devote part of their time regularly and consistently to the solution of new problems. Any suggestion, by whomsoever made, should be welcomed. In the multitude of counselors there is wisdom, and one good idea out of a dozen fruitless suggestions will repay a great amount of study. The use of electricity in mines offers a fruitful field for such research.

The head of a company or of department can never afford to neglect details. He should know his business from A to Z. He must put in a great deal of solid spade work. But he should always use the telescope as well as the microscope, taking a broad outlook as well as making a minute investigation. He must exercise his imagination in the search for new ideas for improvement, else he will spend his days like the man in the famous picture, grovelling for coppers with a muck-rake when by looking up he might have discovered the crown of success. One of his guiding stars must be electricity.

There is a lot of truth in the old saying, "Whatsoever a man soweth that shall he also reap". And whether it is applied to work, study or purity of life it helps greatly in laying the foundation of one's character to feel that we shall reap what we sow. There is inspiration in this for the mining engineer and for the electrical engineer engaged in mining.

REVISED STATISTICS ON THE MINERAL PRODUCTION OF CANADA, 1922

The Dominion Bureau of Statistics issued on July 16th, the following finally revised statistics on the production of cobalt in Canada during 1922, and on July 18th, those on gold.

Cobalt

The major portion of the world's supply of cobalt for almost two decades has been derived from the silver-cobalt-nickel arsenides of the Cobalt district.

During 1922, three smelters in Ontario treating ores and residues from this district marketed cobalt oxide, metallic cobalt, cobalt sulphate, cobalt carbonate, cobalt hydroxide, unseparated oxide and stellite (an alloy of cobalt used for high speed tool metals). The cobalt residues from the cyanide process were mainly treated in Canada during 1922 although some of these as well as smelter residues amounting in all to 518 tons containing 173,211 lbs. of cobalt were shipped abroad for treatment.

The cobalt production of Canada in 1922 was 569,960 lbs. which at $3.25 per pound would be worth $1,852,370. These figures were obtained as the total of the metal cobalt contained in smelter products made in 1922 and cobalt in residues exported for treatment, valued at $3.25 which was the average New York quotation for cobalt during the year.

SUMMARY OF COBALT PRODUCTION STATISTICS, 1922

Cobalt ores and residues treated or in process 3,719 tons. Metallic cobalt content of the above (by assay) 536,400 lbs.

	Output of Smelters		Marketed	
	Total	Cobalt Contained	Quantity	Value as reported by smelters
	lb.	lb.	lb.	$
Metallic cobalt	106,274	106,274	109,067	282,602
Cobalt oxide	360,495	252,347	398,697	798,271
Mixed oxide	86,730	39,023	123,605	99,687
Residues exported	A	172,311	1,036,000	156,402B
Total	Quantity	569,960		1,336,962
	Computed value	$1,852,370		

A — Not given; B — Estimated.

Gold

During the calendar year 1922, the gold production from all sources in Canada amounted to 1,263,364 fine ounces, valued at $26,116,050, an increase of 36 per cent. above the previous year. This production has only been exceeded once, that being in 1900 when 1,350,057 ounces valued at $27,908,153 was produced. In the latter year the Yukon placers reached the peak of their production.

The values given below are those reported by the shippers as the total payments received for gold and silver contained in products shipped.

	Quantity tons	Value as Reported
Gold ores and concentrates shipped	74,624	$ 4,859,045
Bullion shipped from auriferous quartz mines		21,257,302 (A)
Bullion shipped by placer operators		1,488,785

A — Includes $209,256 exchange paid.

Production by provinces as shown below includes:

1.—Gold obtained from Canadian gold ores and concentrates treated during the year either in Canada or in other countries.

2.—Gold obtained from Canadian ores which were treated essentially for other metals.

In determining the values, the standard rate of $20.671834 per fine ounce was used.

Provinces	Fine ounces	Computed Value
Nova Scotia	1,042	$ 21,540
Quebec	....	.....
Ontario	1,000,340	20,678,862
Manitoba	156	3,225
Alberta	....	.....
British Columbia	207,370	4,286,718
Yukon	54,456	1,125,705
Total Gold Production of Canada	1,263,364	$26,116,050

The Rio Tinto copper mines made a profit of £996,354 in 1922 as against £[illegible] in 1921.

The Collieries of British Columbia

III. — Vancouver Island Coal Field

By ROBERT DUNN

All Vancouver Island coal comes from mines within a compass of between sixty and seventy miles along its eastern seaboard. At Extension and South Wellington are the collieries of the Canadian Collieries (D) Ltd. Extension is connected by a short spur railway with the town of Ladysmith, where a fine harbor and modern shipping facilities permit the ready and economic handling of the mercantile trade. North a few miles is the city of Nanaimo, the pioneer coal centre of the American Northwest and the home of the Western Fuel Corporation of Canada. In the same direction some seventy miles we find the Cumberland Mines, operated by the Canadian Collieries, with railway connection with Union Bay. Here is duplicated much the same situation as that at Ladysmith, the coal field inland a short distance feeding a land-locked harbour that offers the best of protection to shipping in search of fuel.

Location and Extent of Coal Field

Vancouver Island is about 300 miles in length and on an average of 50 miles in width — not a great area when compared with the whole of British Columbia with its 372,639 square miles; yet its coal mines in 1921 produced almost as much again as all the others of the Province. Up to the present the development has been confined to that section known locally as the Esquimalt & Nanaimo Railway Belt, a strip of land lying along the east coast within whose boundaries are 3,296 square miles. There are those who hold that the seams of the Cowichan region, roughly forty miles north of the city of Victoria, can be economically exploited. That, however, is a question yet to be decided. No serious efforts have been made to solve the issue in regard to which there is much difference of opinion. Certain it is that in the Newcastle and the Comox Districts there are extensive coal resources. To a limited extent these have been opened up by the companies now active, but there are reserves that will keep the wheels of industry moving indefinitely.

D. B. Dowling, of the Canadian Geological Survey, in his "Coal Fields and Coal Resources of Canada" estimated in 1915 that the actual coal reserve of Vancouver Island was 1,178,000,000 metric tons. In the same volume C. H. Clapp, also of the Survey, is quoted and an excerpt from his observations may not be amiss:

"The coals of Vancouver Island are all, so far as known, of Upper Cretaceous age. They are associated with a thick series of sandstones, conglomerates and shales called the Nanaimo series, which were deposited, largely under estuarine conditions, on the irregular, drowned portions of the pre-Upper Cretaceous erosion surface, developed on the metamorphic and granite rocks of the Vancouver range. The deposition took place chiefly off the east coast of the range in the down-warped basin between Vancouver Island and the Mainland, but some deposition occurred in the broad estuaries extending inland from the northern portion of the west coast."

At another point Mr. Clapp says:

"The area which is underlain by workable coal seams is, however, much less than the total area underlain by the Coal Measures, being approximately one third of the latter. Those basins that probably contain workable coal seams are the Koskeemo, which is a portion of the Quatsino Sound basin, the Suquash basin, and portions of the Comox, Nanaimo, and Alberni basins. Of these the Suquash, Comox and Nanaimo basins contain workable coal-seams, which are being mined at present."

Discovery and Early Operations

Coal was first discovered on Vancouver Island in 1835 at a point on the East Coast then called Fort Rupert, north of the City of Nanaimo. Dr. Geo. M. Dawson, at one time director of the Geological Survey of Canada, read a paper before the Royal Colonial Institute in which he said:

"The existence of coal upon the coast of British Columbia was recognized by Dr. W. F. Tolmie, an officer of the Hudson's Bay Co., as early as 1835, but

though small quantities of coal were actually obtained from natural outcrops from time to time for the use of the blacksmiths at the company's posts, no importance appears to have been attached to the discovery. The world was at that time very spacious and the Pacific Ocean was still regarded rather as a field for exploration of navigators than as a highway of commerce between America and Asia. Afterward (in 1849) the Hudson's Bay Company brought out a few coal miners from Scotland and proceeded to test and open some of the deposits."

The Nanaimo coal deposits were seriously exploited from about 1852 and before the close of the following year 2,000 tons of coal are reported to have been shipped, chiefly to San Francisco. The Hudson's Bay Co., under the name of the Nanaimo Coal Co., continued to work the mines until 1861, when they were sold to the Vancouver Coal Mining & Land Co., Ltd. The area in question has been operated without cessation ever since and No. 1 Mine, Nanaimo, notwithstanding frequent reports that its days of production were numbered, still is one of the largest and most consistent producers of the Province. At present it, together with several auxiliary properties, is worked by the Western Fuel Corporation of Canada, the direct inheritor of resources first recognized and exploited by that pioneer Canadian corporation, the Hudson's Bay Co.

Mines of Western Fuel Corporation

The mines of the Western Fuel Corporation in 1921 had an output of 566,034 tons which, it will be noticed, is a substantial part of the total provincial production for the year, which was 2,483,995 tons. Underground and surface development have kept pace with requirements. Steam is the motive power for almost all operations. At No. 1 there are two Babcock & Wilcox water-tube boilers and at least ten return tubular boilers, the whole generating upwards of 2,000 h.p. There also are two large 2,500 cubic foot Canadian Ingersoll-Rand cross-compound compressors used to provide air for mining machines, winches, etc. A 250 KW generator supplies power for the electric locomotives used for transportation on the main level. A 30" x 60" steam hoist with a 15-foot drum is another part of the equipment. At Protection Shaft, Protection Island, there are six 150 h. p. boilers, two compressors similar in type to those of No. 1, a hoist of the same dimensions as to cylinders but with a 12-foot drum, used only in the lowering and hoisting of workmen, and a forced draft fan which ventilates the north side of No. 1, the return being the shaft on Newcastle Island. At No. 1 there is a Sirocco fan for the ventilation of the south side of the mine, the return being by No. 2 shaft alongside. An auxiliary hoist and fan are installed at Newcastle Island, which can readily be put into operation in the event of a break-down at Protection. All coal is brought out at No. 1 shaft and screened and prepared there. No. 1 level at present is some three and one-half miles in length and, while a considerable part of the mining now is submarine, much of it is going on beneath the islands lying in and around Nanaimo Harbour.

The measures of the Nanaimo field consist of three seams known as the Douglas, Newcastle and the Wellington. The first is the uppermost and the last the lowest. At No. 1 Mine the Douglas and Newcastle seams are being exploited. The "Wakesiah," and the "Reserve" Mines of the same Company are being worked on the Wellington and Douglas seams respectively. The "Wakesiah" was opened about two years ago and at present the output averages about 400 tons a day. This mine is two miles from Nanaimo. The contour of the field is irregular, and haulage, which is taken care of by five winches driven by compressed air and supplemented by horses, is both difficult and costly. There are two shafts sunk to a depth of 320 feet and coal is hoisted from No. 2 shaft, steam being furnished by two boilers of 160 and 140 h.p. Ventilation is produced by a single inlet Murphy fan, driven direct. The mine is damp and free from coal dust. The "Reserve" is in the Cranberry District, five miles south of Nanaimo, and the coal is reached by two shafts at a depth of 955 feet. The seam varies in thickness from 1 to 20 feet and the coal is soft with a fairly strong roof. A pair of 90-inch Sirocco fans take care of ventilation, being capable of producing 140,000 cubic feet of air a minute against a 3-inch water gauge. There are twelve compressed-air hoists and the surface plant consists of four return tubular boilers, each 208 h.p.; a hoisting engine 30 x 60 inches with 12-foot drum, and another 24 x 48 inches with 12-foot drum, each having an automatic overwinding device; one cross-compound Canadian Rand compressor and an Ingersoll-Rand compressor, with a capacity of 22,000 cubic feet of air a minute at 120

Ships Bunkering at the Docks of the Western Fuel Corporation, Nanaimo, B.C.

revolutions. An electric generator supplies light above and below ground and there is a three-car self-dumping tipple with shakers consisting of two screens, 1½ inches and ¾ inch respectively, a picking table, and nut and cross conveyors driven by a small steam engine.

Coal Washery and Oil Flotation Units

Experiments in oil flotation have been carried on by the Western Fuel Corporation, Canadian Collieries (D) Ltd., and the Granby Consolidated Mining & Smelting & Power Co. In this connection recent improvements in the washery plant of the first named are interesting. All the coal of the company's various mines is assembled at a central point on the water front in Nanaimo where the bunkers, wharves, car-ferry ship, and blacksmith, machine and carpenter shops are located. There it is screened and washed preparatory to marketing. Recent changes in the washery involved the discarding of the jigs and the substitution of four Deister coal concentrating tables and the installation, as an auxiliary, of the Peterson Oil Flotation Plant. The latter is designed to treat material from the refuse dump and the discard from the picking tables in the washery. The material in the refuse dumps is carried into the plant by a paddle conveyor, which delivers it to a trommel-screen; the oversize passes from the trommel by gravity down a launder to an 8-foot Hardinge ball-mill; the undersize passes by gravity into a screw classifier, the oversize from which passes by gravity to two Diester coal-concentrating tables. These tables give three products—coal, middling, and rock. The undersize or overflow from the screw classifier is carried by gravity to a battery of six Peterson flotation cells; the flotated product from two of these cells is clean coal and from the other four middling. The coal from the flotation cells passes by gravity into a settling tank 30 feet in diameter, from which the dewatered fine coal passes to a paddle conveyor, by which it is carried to railway cars ready for market. The middling from the flotation cells passes by gravity along a launder to a bucket elevator near the ball mill, into which the overflow water from the settling tank is also discharged. The bucket elevator discharges into a launder, along which the material passes by gravity to the trommel screen already mentioned and is subjected to the same series of treatments as has been described. The coal and the middling concentrate made on the Deister tables are carried by gravity to a second screw classifier near the settling tank, so that the overflow from the classifier can be discharged into the settling tank, while the fine dewatered coal is carried to the paddle conveyor, which delivers it to the railway cars. One of the advantages of this treatment is that the slack can be more thoroughly picked over on the picking tables and a cleaner product made because practically all the carbon in the refuse is saved later in the concentrating washer.

Edison safety lamps are used almost entirely in the mines of this Company. Speaking generally, the plant is of the most modern description and the mining practice similar to that in most present-day bituminous coal fields. The pillar and stall system is that most used. Where conditions make it an economic necessity, the longwall method is adopted, this being so in a section of No. 1 Mine. G. W. Bowen, the vice-chairman of the Company, and John Hunt, general superintendent, are the active heads of the concern. Robert Laird is Mine Manager No. 1 Mine, Robert Henderson, at the Reserve, and William H. Moore at the Wakesiah. The Harewood, another of the group of subsidiary mines of this Company, may be passed with a word because it was abandoned early in January last, its long career as a producer at an end. With a capable and loyal staff, and by virtue of a broad and considerate policy, the Company maintains cordial relations with its employees, and the industry has flourished, without serious interruption, for scores of years.

(To be continued.)

BRITISH MIGRATION

An official American observer in Western Europe discusses unemployment in Britain thus, in *Commerce Reports:*

Great Britain has made enormous strides since the armistice along financial, commercial, and industrial lines. Unemployment is now the basic difficulty. Although at the present time industry is working almost to capacity, the live unemployment registers show a million and a quarter persons out of work, and, as a matter of fact, it has been estimated by certain experts that the actual total unemployment in that country is now almost one and three-quarter millions.

This problem in Great Britain seems to be based on several factors aside from the one commonly mentioned—that the population is growing beyond the industrial capacity of the country to support it. During the war women and minors were employed in various industries and are still employed to a considerable extent. A large proportion of the pre-war idle class has been compelled to seek productive employment. Much of the land that was plowed up during the submarine blockade has been allowed to go back to pasture, and surplus farm laborers are also drifting into the ranks of the unemployed in a steady stream. All these causes together have their effect upon the present situation.

There have been considerable fluctuations in the unemployment situation in this country since the armistice. In 1919 and the first part of 1920 the demobilization of troops, together with the shutdown of munition works, increased the number of unemployed to a great extent. During 1920 these persons were steadily employed in industry, but in 1921, owing to the widespread business depression, unemployment, which had dropped to less than a million, went over two million in midsummer. There has been a continual but slow reduction since that time with the exception of the winter months of 1921-22 and 1922-23.

Opinions differ considerably as to the remedy for this situation. Some believe that it will be corrected in due course of time by new commercial and industrial developments, but a large percentage of expert opinion seems to indicate that the only remedy is emigration. The matter may be brought up at the Imperial Economic Conference next fall; and if so, there will be the inevitable disagreement between Great Britain and the Dominions as to the type of emigrants to be sent out. Efforts are already being made to dispose of certain portions of the surplus population, but co-operation between the Mother Country and the Dominions will be necessary in order to execute such a program on a large scale.

COPPER PRODUCTION IN ALASKA INCREASING

The copper production of Alaska in 1922 was 77,967,819 pounds, valued at $10,525,655, compared with 57,011,597 pounds, valued at $7,354,496, in 1921, according to the U. S. Bureau of Mines. The production in 1922 came from one mine in the Ketchikan district, three on the Chitina district, and one in the Prince William Sound district. These figures are taken from the annual report of the Geological Survey on Alaska mineral resources, now in preparation.

Field Work of the Staff of the Victoria Memorial Museum, 1923-4

By WILLIAM McINNES, Director

The Victoria Memorial Museum, or National Museum of Canada, carries out original scientific investigations on the wild animals and birds of Canada, its botany and the aboriginal Indian tribes, in addition to maintaining at Ottawa a National Museum. In the museum are displayed collections and specimens illustrating the natural history of Canada and its anthropology and archaeology.

In order that the subject of bird and wild animal protection and conservation may be intelligently and effectively dealt with by the State, the life histories of the birds and animals must be thoroughly known, and this subject is now principally engaging the attention of the biological staff. The botanist is dealing with the plant life of Canada in a similar way.

Canada recognizes a moral obligation toward the native Indian tribes, and through the Department of Indian Affairs takes a fatherly interest in their well-being. The scientific study of the origin of the aborigines, their migrations, languages, culture and beliefs is outside the scope of that Department, and is carried on by the Anthropological Division of the Museum. Linked up with the preceding is a study of the Archaeology of the country and this subject will be given attention by two parties, one working in British Columbia and one in Ontario.

A programme of the field work for 1923-4 in detail follows: —

Biological Division — Botany

M. O. Malte, Chief Botanist, National Herbarium, is continuing his survey of the flora of the Ottawa region, covering a radius of about twenty-five miles on both sides of the Ottawa valley in the Provinces of Ontario and Quebec, and extending the explorations in some cases to a greater distance, as up the Gatineau valley. This field work has advanced appreciably the information necessary for the completion of the work on the Flora of the Ottawa district begun by the late Professor John Macoun and James M Macoun. Dr. Malte began the field work with the appearance of the first spring plants and expects to continue it until late in the autumn. Since the 1st of June he has been assisted by H. A. Quackenbush, a student assistant who helped him in the same kind of work in 1922. Mr. Quackenbush will be engaged in the work until September. Several hundred sheets of herbarium specimens have already been added to the collection during the present season.

Zoology

P. A. Taverner, Ornithologist, will have a short season of field work, having remained in Ottawa to complete his work on the "Birds of Western Canada". In the furtherance of this work he expects to spend some time in the field in Alberta in September and October.

Charles H. Young, Senior Collector Preparators, left for Waterton Lakes Park, in southwestern Alberta, about May 1st and has planned to collect birds and mammals in that region, carrying his work further out from the foothill than was done during the preceding season.

R. M. Anderson, Zoologist (Mammalia) is spending the early part of the summer in museum and office work, and is expected to spend parts of August, September, and October in biological collecting in eastern Quebec, and also a short time in Nova Scotia if time permits.

Joseph Rochon, Osteological Preparator, and **Donald MacDonald,** Museum Helper, are expected to spend part of September and October in collecting osteological material in Pontiac county, Quebec.

Clyde L. Patch, Chief Taxidermist and Herpetologist, will collect local fauna and accessories for habitat groups in the Ottawa region. He will also spend one week as instructor in natural history subjects at a Y.M.C.A. boys' camp at Golden Lake, Ontario. D. Blakely, Taxidermist, and Claude E. Johnson, Artist, will spend some time collecting specimens of local fauna and accessories for the museum in the Ottawa region.

J. D. Soper, Junior Zoologist (temporary) will accompany the "Arctic" expedition under J. D. Craig, to Baffin Island, Ellesmere Island, and Greenland, and collect material for the Victoria Memorial Museum, principally birds and mammals, although he will endeavour to obtain some entomological, botanical, and ethnological material as well. His work is expected to be mainly in the Northwest Territories (Franklin district), but some material may be obtained when the ship stops at Hamilton Inlet, Labrador, and in Greenland.

Anthropological Division

Harlan I. Smith is to continue this summer his researches into the material culture, particularly the ethno-botany, of the Bella Coola Indians, including in his work both the aborigines of the village itself and the Chilcotin tribes who descend to the coast there during the summer months. At the same time he is to investigate the archaeological remains in the surrounding district, and make casts of the ancient rock carvings left there by an earlier people. It is hoped that his work will throw some light on the original inhabitants of this region. He left for the field on May 15th and expects to return towards the end of September.

Mr. McIlwraith is also to work at Bella Coola this summer, his special field being the social organization and religious beliefs of the Bella Coola Indians. This work will occupy him about five months, from the beginning of July until the end of November or beginning of December. It will enable him to complete the survey, begun by him last year, of this important and little known tribe.

C. M. Barbeau, left Ottawa on June 16th to continue his work of previous years among the Indians of the Nass River. He expected to spend some weeks near Hazelton, among the Gitshan Indians, then to move lower down the Nass River to investigate some of the neighbouring groups. This work will occupy him about three months. On the return journey he is to make some investigations into the early history of the Indians of the Okanagan valley, and the Stony Indians of the region around Morley, Alberta. He expects to return to Ottawa some time in October.

D. Jenness is to work during the coming winter on the manners and customs and early history of the Carrier Indians of British Columbia. These natives are scattered in small bands on various rivers and lakes during the summer months, but congregate during the winter at different villages along the Grand Trunk Pacific Railway between Prince George and Hazelton. Mr. Jenness will therefore leave for the field about October 1, and station himself at whatever village between these two points seems most favourable. This work among the Carrier Indians represents a new effort on the part of the Division of Anthropology to investigate the rather inaccessible tribes of the northern interior of British Columbia and of the Mackenzie and Yukon valleys, of which the Carriers are the southern most representatives. Mr. Jenness will probably carry on his work around Prince George or Hazelton until the end of the fiscal year.

W. J. Wintemberg left Ottawa on June 15 to investigate some of the archaeological remains in the counties of Simcoe, Gray and Bruce, hoping to discover traces of an earlier population in this part of Ontario different from the inhabitants of the prehistoric Roebuck village, excavated by him years ago. This work will occupy him until September 4. He will then make an intensive exploration of a prehistoric village in Middlesex County, returning to Ottawa about October 8.

Dr. E. Sapir, Chief of the Anthropological Division, left for Camp Red Cloud, Pennsylvania, on June 1st, to work with two Alaska Indians at present living in that place. One of these Indians came from Anvik, near the mouth of the Yukon river, the other from Fort Yukon, near the Alaska-Canada boundary. Their dialects differ considerably from one another, but both belong to the group of languages spoken throughout the whole of the Mackenzie valley area in Canada. Last year Dr. Sapir discovered that some of these languages, notably the Sarcee dialect spoken near Calgary, have the peculiarity of possession tone, like Chinese, and his work this summer with the Alaskan Indians aims primarily at determining whether this peculiarity prevails throughout the whole of northern Canada and Alaska, and whether it corresponds in any way with the tone of Indo-Chinese languages. He expects to carry on this work at Red Cloud Camp until the end of August.

MINES BRANCH SUMMARY REPORT

The Summary Report for 1921 of the Mines Branch, Department of Mines, Ottawa, was published recently. The interval of 18 month between the end of the work described and the date of publication of the report would be a more serious matter were it not for the fact that the results of a number of the 1921 investigations have been made public already in bulletins issued by the Director and in papers published by technical societies and periodicals. If the long delay in issuing the complete Summary Report should continue as at present, it might be of value to the Mines Branch, as well as to the technical public, if the practice of making prompt, informal reports were extended systematically to cover the major part of the investigations made.

Calcite. — H. S. Spence reports on an occurrence of calcite in the north of Frontenac county, Ontario, which is 96.75 per cent. calcium carbonate. It is a vertical vein or band, 90 feet wide at one end, at least 850 feet long, and 65 feet wide at the other end. Mr. T. B. Caldwell has been shipping calcite from it to the United States, to be ground and used in paints and for similar purposes. Mr. Spence describes briefly also the Derry quarry of the M. J. O'Brien Company, in the Buckingham district, Quebec.

Alkali Deposits of Western Canada.—L. Heber Cole describes deposits of sodium sulphate and magnesium sulphate examined during the field season in Alberta and Saskatchewan. Sodium sulphate, or salt cake, is used in making sulphate pulp and in making glass, as well as in the refining of nickel. In the hydrous form (Glauber's salt) it is used in tanning, in dyeing and as a medicine. Magnesium sulphate (Epsom salts) is used in the cotton industry, in dyeing, for certain agricultural purposes and as a medicine. Some of the deposits are being worked.

Oil-bearing Shales. — S. C. Ells examined outcrops of shales of Cretaceous age in Manitoba and Saskatchewan that might be of commercial importance. He found all these to be too low in petroleum and nitrogen content to be of present economic interest. Mr. Ells also summarizes the occurrences of oil shale in Canada.

Natural Gas. — R. T. Elworthy describes the natural gas supplies of Canada, so far as determined, and discusses their possible use as a source of helium, gasolene, carbon black and other products. In the following section he points out the possibility of treating natural gas chemically in such a way as to produce methyl alcohol and formaldehyde.

Bentonite. — E. S. Thompson and A. Sadler have made a laboratory study of this mineral, comparing it with American occurrences of bentonite. Complete analyses of six samples of Canadian bentonite show silica from 54 to 70 per cent. and alumina from 20 to 14 per cent., with 8 to 12 per cent. water and minor amounts of other ingredients. The bentonite absorbs up to five times its weight of water. Its chief use has been as a filler in paper manufacture, and various similar uses are suggested.

The work of the Ore Dressing and Metallurgical Division is summarized by W. B. Timm, chief of the division, and described in detail by his assistants.

Low-Grade Copper Ore from Anyox. — Experiments made by R. K. Carnochan and C. S. Parsons show that this ore is amenable to flotation, which yields a good grade of concentrate and gives a high recovery. Experiments were conducted on both a small and a large scale, using a carload of ore.

Flin-Flon Complex Ore. — C. S. Parsons and R. J. Traill, who have examined the diamond-drill ores across the high-grade portion of the Flin-Flon deposit, show by microscopic examination that the three sulphides of copper, zinc and iron are intimately mixed, but can be separated satisfactorily by grinding to 200 mesh. They can be separated by selective flotation; but as the gold and silver values ($2.00 per ton) are distributed through all three sulphides, it is not likely this method will pay. Roasting and leaching tests indicate good recoveries of copper and zinc; but the tailing would require further treatment to recover the precious metals. Pyritic smelting to obtain copper matte containing the gold and silver is the method indicated as most easily feasible for treating this ore, the zinc being slagged off.

Graphite. — C. S. Parsons treated a sample of ore from the North American Graphite mine, Buckingham,

Que., and found that high-grade products and a good recovery were made by flotation, following practice of already established in the laboratories and applied in the mill of the Quebec Graphite Company.

Lead-Zinc-Silver. — C. S. Parsons and R. J. Traill treated both carbonate and sulphide ores from the North Star mine, Kimberley, B.C. After the carbonate ore had been treated with sodium sulphide, both were found to be amenable to selective flotation, giving good recoveries.

Asbestos. — R. K. Carnochan mentions that the "cyclone" and "jumbo" fiberizers are costly as to power consumption, maintenance and repair, and destroy the long fibres unduly, and shows that dry crushing in a ball mill gives a satisfactory result. It is not possible to compare this result with that of standard practice, as there are no data available of the latter.

Nickel-Copper. — C. S. Parsons has indicated by tests on low-grade Sudbury ore that flotation will give a fairly high-grade copper-nickel concentrate, with a good recovery of values from the ore.

Garnet. — Two samples of garnet rock from Bancroft, Ont., gave good recoveries on the Wilfley table, after crushing and classifying, giving 7.9 and 24.1 per cent. recovery, respectively. A larger shipment from Depot Harbour, Ont., gave 14.7 per cent. recovery in various sizes by tabling, and suction during the crushing gave a ground mica product that promises to be of value.

Brass.—Tests by C. S. Parsons show that a high-grade product, suitable for re-melting, can be made by crushing brass foundry slag and sweepings and putting it over a Wilfley table.

Gold. — Tests on samples of ore from Rice Lake, Manitoba, have been examined by R. K. Carnochan and a suitable method of treatment recommended.

Molybdenite. — Four 200-pound samples of molybdenite ore from the vicinity of Wilberforce, Ont., and a sample from near Masham, Que., gave excellent recoveries and high-grade concentrates by flotation.

Euxenite. — Three-quarters of a ton of feldspar containing the radium-bearing mineral euxenite was received from a feldspar quarry near Maberley, Ont., and clean concentrates by gravity equal to 3.67 per cent. of the total were made by R. K. Carnochan. The loss in treatment was 10.23 per cent.

The work of the Chemical Laboratory is reported on by H. C. Mabee, chemist in charge, and represents a varied lot of determinations of samples received from all quarters of Canada.

Fuels and Fuel Testing. — The work in this division, under the direction of B. F. Haanel, includes experiments by J. H. H. Nicholls and Harold Kohl on lignite carbonization, an investigation of kerosene oil and another of cod liver oil as a lubricant, by P. V. Rosewarne, and an investigation of oil shales by S. S. Swinnerton.

Clay. — For the Ceramic Division, the late Joseph Keele has reported various tests of clays sent to him for examination, and draws attention to some occurrences of pottery clay of industrial importance. He also discusses the working of stony clays, and records the progress of the pottery industry in Canada.

Kiln Scum. — During 1921 a brick company at Ottawa were troubled much with kiln scum. Mr. Keele found that this was due to soluble sulphates contained in the shale used. He made some tests that showed that a small admixture of barium carbonate, three [illegible] 1,000 bricks, prevented this effect by turning the soluble sulphates to insoluble barium sulphate. This was applied successfully in practice in the brickyard, completely preventing the scum.

Pottery. — Mr. Keele draws attention to the excellent opportunity there is in certain parts of Canada for making pottery and table ware of the heavier varieties.

Road Materials. — The systematic examination of gravel pits and other deposits of road-building material was continued during the year by Henri Gauthier, samples being tested in the laboratory.

Peat. — The volume concludes with the report of the Joint Peat Committee for 1921.

INDUSTRIAL ITEMS

Canadian Link-Belt Company Limited have changed their name to Link-Belt Limited, explaining that the old name was too long and full of repetition. Link-Belt Limited are well-known as manufacturers of original Ewart link-belts, socket wheels, conveying and elevating machinery, locomotive trains, electric hoists, etc. Their Toronto address is Wellington and Peter Streets, and at Montreal they are located at 10 Gauvin Lane.

Turbro Waughoist, Model 300, a new product of the Denver Rock Drill Manufacturing Co., is completely described in their new bulletin, number 300. It is a heavy double drum portable hoist designed primarily for scraping, operating on the well-known principle that is the basis of Turbro Waughoist construction. It develops 10 horsepower at 50 pounds air pressure and weighs 495 pounds.

Worthington Pump and Machinery Corporation have put on the market recently a new type of deep well pump, which uses one or more impellers much like a ship's propeller to elevate the water or other liquid. The efficiency, capacity and operating economy of this new pump are said to be far in advance of any deep-well pump now in use.

Diesel oil engines are now being installed quite generally to provide power at mines. Lammers and Maase, who handle the well-known Polar Diesel Engine, have calculated that it provides power just as cheaply, or more cheaply, than hydro-electric power in Northern Ontario. Their figure for a 400-horsepower engine is $30.00 per horsepower year, with fuel oil at 12 cents a gallon.

The Robins Conveying Belt Company's "Handbook of Conveyor Practice" is a 96-page book full of useful information about conveying problems and their solution. Belt conveyors and accessories are the main issue; but ore bridges, ship loading installations, ore bedding systems, car dumpers and special conveyors in industrial plants are also part of the Company's products.

Messrs. Glenfield and Kennedy, Ltd., Kilmarnock, Scotland, have just placed on the market a new pressure meter for the measurement of oil and other liquids. The meter is of the displacement type, is made in standard sizes from 3-inch to 8-inch bore. The 6-inch size handles 16,000 gallons of oil per hour, with an overload capacity of 25,000 gallons. It is simple and rugged in construction and accurate in measurement.

Bauxite to the extent of 8,905 tons was shipped to the United States from British Guiana during the first quarter of 1923.

BOOK REVIEWS

THE ELECTRIC FURNACE FOR IRON AND STEEL, By Alfred Stansfield. McGraw — Hill Book Co., 370-372 Seventh Ave., New York — 450 pages, illustrated. Price $5.00.

In this volume, just through the press, Dr. Stansfield brings up to date part of his book, "The Electric Furnace," first published in 1907 and re-written in 1913. The use of the electric furnace has made such strides during the last ten years that now it would serve no useful purpose to include a discussion of all its uses in one volume. The present volume is concerned exclusively therefore, with its use in the metallurgy of iron and steel. A second volume will describe its uses in other branches of metallurgy.

The volume is divided into three parts. Part I describes briefly (41 pages) the history of the electric furnace, the elements of iron and steel metallurgy and the essential points of the electrical supply required for this purpose. Part II deals comprehensively with electric smelting of iron ores by various methods, and the production of ferro-alloys. Part III describes the manufacture of steel and the important types of electric furnace used for this purpose. In each part the fundamental principles involved are carefully explained, and the historical development of method and apparatus is given adequate attention. The volume is concluded by an unusually thorough, though brief index — a section that too often receives only the fag end of an author's attention.

A chapter that will attract much attention at present is that with the caption, "Indirect Electric Smelting of Iron Ores," which deals with the production of sponge iron . Dr. Stansfield has done a good deal of research into this method. One can gather, from his continued and active interest in this subject, that he has hopes that a commercially successful process will be evolved. Fundamentally such a process offers a means of producing iron and steel more cheaply than in the blast-furnace, and is particularly adaptable to conditions in certain parts of Canada.

This book promises to be, in the field of electric iron and steel, what Dr. Stansfield's former book has become for the electric furnace — a standard text-book and book of reference. We can discern in the present volume the same qualities of thoroughness, balance and unequivocal statement that have made the first book so valuable.

A TEXT-BOOK OF ORE DRESSING, By S. J. Truscott — MacMillan and Co., St. Martin's St., London, and MacMillan Co. of Canada, St. Martin's House, Toronto, Ont. — 680 pages — fully illustrated. Price $12.00

The author of this compendious volume is professor of mining at the Royal School of Mines in London, and the book is a result of his teaching and practical experience. It is designed as a text-book, as well as a general work of reference. It deals with the metalliferous ores particularly, and will be followed by an additional volume dealing with coal-washing and the dressing of non-metalliferous ores.

The author devotes a large part of his space (pages 389 to 513) to flotation, which is much in proportion to the present important position the principle of flotation holds in ore-dressing. This section of the book makes it particularly valuable.

The arrangement of the various sections is systematic and consecutive. "Comminution", including crushing and grinding, is followed by "sizing", on screens and in water. "Water concentration," and "flotation concentration" are major sections, followed by magnetic, electrostatic, pneumatic and centrifugal separation. "Heat treatment," including drying, calcining and roasting comprises a chapter, as well as "the control of operations," involving sampling and assaying. A short final chapter describes the application of the principles elucidated and the mechanisms described in the book, as ore-dressing systems and plants.

An author of olden time used to dedicate his work to a benefactor; nowadays he usually addresses a friend. Mr. Truscott has made himself unique in his dedication — in a way we shall leave the reader to discover.

GRAPHITE, (1913-1919) — Imperial Mineral Resources Bureau, Imperial House, Kingsway, London, W. C.2. — 57 pages. 1s 7d post free.

As indicated in this report, the British Empire is in a satisfactory position in regard to the mineral graphite. For long Ceylon has been pre-eminent for its high-grade graphite, which has been the favourite with the makers of crucibles. In view of recent reports that the deposits in Ceylon are approaching exhaustion, it is interesting to note the conclusion that low prices only are the cause of the diminished output, and "that there are still large reserves of graphite available if costs can be reduced to meet market conditions." In 1913 Ceylon provide 28,540 long tons of graphite in a world's total of 131,245 tons. In 1920 the figure is 9,205 tons out of 101,301 tons.

Elsewhere in the Empire, Canada is outstanding on account of the large reserves of graphite in the Buckingham district of Quebec and in Lanark and Haliburton counties in Ontario, as well as the unique Black Donald mine in Renfrew county, which has provided the larger part of all graphite mined in this country. The production was 1,930 tons in 1913, reached a peak of 3,531 tons in 1916, and fell to 837 tons in 1921.

The good market during the war stimulated a small production of graphite in India and Australia, but this has declined again.

Apart from the former territory of Austria, which used to be the world's largest producer of graphite (mostly amorphous), Germany is the world's largest producer (again largely amorphous graphite). Since 1908 Madagascar, which is underlain mostly by ancient crystalline rocks, has become a serious competitor with Ceylon in the higher grades, with a maximum of 34,000 tons in 1917. Japan has important deposits in Korea, a large part of the product being shipped to the United States. There are other deposits of lesser importance, well distributed throughout the world.

STATISTICS, 1919-1921 — Imperial Mineral Resources Bureau.

The volumes on Copper, Iron and Steel, and Lead in this useful statistical series have now been issued.

SPINEL

This mineral sometimes occurs in fine ruby red crystals of value as gems. While the color is very like that of the true ruby, the shape of the crystals easily distinguishes the two minerals. True ruby is hexagonal in form, while spinel ruby is usually in octahedrons of the cubic system. Blue spinel resembles sapphire in color. Fine blue spinel crystals have been found in Daillebout, Quebec.

THE MINING DISTRICTS

By THE JOURNAL'S CORRESPONDENTS

NORTHERN ONTARIO

Argonaut. — After a number of delays the Argonaut mill was finally put in commission the first week of July, and is treating between 50 and 75 tons a day. The mill has a capacity of 200 tons a day, and the company will gradually increase the capacity to this figure.

Kirkland. — Underground work at the Bidgood has been stopped and it has been decided to carry on further exploration work by diamond-drilling. It is understood that the Tonopah Mining Company is negotiating for a working option on control.

The Kirkland Townsite Gold Mines has been taken over by the Anglo Canadian Explorers Limited, of London, England. The latter company is a subsidiary for John Taylor & Sons, who will proceed with active development. A shaft will be sunk to a considerable depth, and exploration work will be carried on underground. The property is well located and is thought to have very good chances.

During the month of June the Teck-Hughes produced $103,000, which is one of the best months in the history of the company. Underground developments continue favorable and three new levels, the 8th, 9th and 10th, are now being operated.

Lake Shore is cutting a station at the 800-foot level, and will shortly start development work from this depth. The No. 1 vein came into the shaft at 750 feet, where the grade of the ore was higher than at 600 feet. It is stated that at the 600-foot level 1,900 feet of drifting west of the shaft was all in ore with the exception of 50 feet. Good progress is being made with the enlargement of the mill, and it is hoped that 300 tons a day will be treated this fall.

Underground mining work has been stopped at the Kirkland Gateway, and the company will concentrate on diamond-drilling from the 350-foot level.

Cobalt. — During the month of June, Nipissing mined ore of an estimated net value of $181,942, and shipped bullion of an estimated net value of $98,791, silver being estimated at 63½ cents an ounce. The low-grade mill treated 6,372 tons and the high-grade plant 179 tons, while the refinery shipped 151,882 fine ounces of silver. There were no new developments underground during the month, but stoping operations continued to be satisfactory.

Work has been stopped at the Genessee property and an effort will be made to raise fresh funds to continue work below the 350-foot level, where some good ore was encountered in a winze.

Underground operations are under way at the old Provincial Mine and a small amount of high-grade has been encountered in stoping operations. The company proposes to break milling ore and to start shipments in the fall.

A new vein has been cut in a crosscut north of the shaft on the Colonial property, which is controlled by Continental Mines. The crosscut is on the 930-foot level, and the vein is understood to carry substantial milling values.

Gowganda. — Directors of the Castle-Trethewey deny that any immediate reorganization of the company is contemplated. The company still has $25,000 cash on hand, and if funds are needed for the building of a mill they will probably be borrowed. Above the 400-foot level there are 800,000 ounces in sight, and the mill ore is stated to average about 40 ounces to the ton. A crosscut will shortly be driven on the 550-foot level and if the results are equal to those in the upper levels the ore reserves should be doubled in a short time.

South Lorrain. — Canadian Lorrain Silver Mines, which has taken over the Maidens property in South Lorrain, has purchased a mining plant. The company is controlled by interests associated with the Keeley, and the property will be developed energetically.

The McKinley-Darragh has taken an option on the Paul claims in Lorrain, on which a silver discovery was made a short time ago.

The Mining Corporation has encountered silver at a depth of 50 feet in the new shaft being sunk on the Trout Lake property in Lorrain.

Porcupine.—Figures for the McIntyre year are not yet available, but it is understood that, notwithstanding the serious power shortage extending over approximately five months, the results will show an increase over the preceding year. One of the directors recently stated that no increase in the dividend rate would be made until the cash surplus has been built up. The company is considering the sinking of a central shaft to 5,000 feet, which will call for a large expenditure. Production at present is at the rate of approximately $300,000 a month, and with plenty of water in storage above the power plants, there is no reason why this rate cannot be maintained until next winter.

During the month of June, Dome Mines produced $421,799, as compared with $350,000 for the corresponding month of 1922 and $355,000 for May of the present year. This is probably the largest month's production in the history of the company, and it is understood that production will be maintained in the neighborhood of $400,000 a month.

Underground developments at the Vipond continue to be very promising and the company is making arrangements to increase its milling production to 180 tons a day. It is expected that this work should be completed by December, and in order to provide against an anticipated power shortage next winter, it is proposed to install a 300 h.p. Diesel engine in the mill. When milling is started it is expected that the grade of the ore will run around $10.00 a ton. On account of the insufficiency of power very little work has been done so far on the recent discovery on the 1,000-foot level, but preparations are being made to start several drills on this new vein.

A small 10-stamp mill at the Davidson was destroyed recently by fire. The loss, however, was very small, as the plant was not in operation.

Following the strike vote held a short time ago in Porcupine camp, an application has been made to the Dominion Department of Labor for a Board of Con-

ciliation to deal with the miners' demand for an increase of 20 cents a hour. Mr. Balmer Neilly will represent the operators, while Mr. Ryan will represent the men.. These two gentlemen have not been able to agree upon a chairman, so that this appointment will be left to the Government. It is expected that the Board will sit in Porcupine some time during the week commencing July 22nd.

NORTHWESTERN ONTARIO

Mr. Keefer's New Office to be in Port Arthur — The mineral, timber, agricultural, game and fisheries, and highway development interests of Northwestern Ontario, comprising that part of the Province lying between White River, 250 miles east of Port Arthur, and the Manitoba boundary 330 miles west of this city, are of such magnitude and growing importance, that administration from the seat of the Legislature at Toronto has been found to be not only time-wasting and expensive, but has been a distinct handicap on development, for the reason that the necessary attention their importance warranted could not be given them by Ministers of Departments under whose care they were. This condition caused the expenditure of large sums of money, and a great waste of time annually, by residents of this section in being compelled to visit Toronto, to lay properly before the Administration the needs and requirements of the various cases involved.

In order to overcome this difficulty, the newly elected Conservative Government has created a new office, that of Parliamentary Under-Secretary of the Departments of Mines and Lands and Forests, and have appointed Mr. Frank H. Keefer, K.C., M.P.P. for Port Arthur, to the Secretaryship. Mr. Keefer will open an office at Port Arthur and devote his whole time to the duties, with the necessary staff to take care of local legislative requirements, where anyone having business with any Department of Government may have it transacted without going to Toronto or communicating directly with the Government.

Mr. Keefer had his first case today, when strong representations were made by a deputation on a matter directly related to mineral development, which, without this office, would have necessitated a trip to Toronto, with added expense and delay.

Mr. Keefer is eminently fitted by a long residence and association with the needs of the western mineral interests, in which he has taken an intelligent and sympathetic interest. He is a firm believer in their possibilities.

NOVA SCOTIA

Charter Revoked. — The Communist leaders of District 26, U. M. W. A., have succeeded at last in defeating their own purpose. John L. Lewis, President of the U. M. W. A., has revoked the charter of the district as a means of disbanding its executive, and has appointed Silby Barrett, former International Board Member, as provisional President of the District, with authority to appoint a provisional executive and then hold an election. Thus the fiery J. B. McLachlan, in his defiance of the provincial and federal authorities, as well as of the U. M. W. A. headquarters, has succeeded only in bringing his dupes, the miners, into further disrepute in the eyes of the world, and in wrecking the plans of himself and his brother Communists for "Red" rule in Canada. The "mad adventure", as President Lewis termed it in his letter to Dan Livingston notifying him that his executive had been deposed, has served a useful turn in ridding the district of the domination of these misguided enthusiasts.

Unwise Leadership. — District No. 26 is now isolated, its charter revoked, and it stands without moral or financial support. It has not even the consolation of knowing that it had behind it a good cause. No intelligent workman, not even those on strike, can give a sound reason for the strike. They admit they are on strike for no concession in wages, no principle of agreement, no complaint against the Coal Company,— nothing but the removal of the forces which stand for law enforcement. They have been led into this plight of humiliating helplessness by leaders whose ambitions are irreconcilable with society as at present constituted, and like all honorable men they dislike to break away from their comrades. But many are breaking away, and many others have never joined the struggle. These latter saw the utter uselessness of it all from the beginning. Never did labor leaders play into the hands of their opponents and throw away every chance of winning as did these foolish men. Not again for a long time will the miners of Nova Scotia be able to win back the prestige now lost. Probably it is better that it should be so, for the land will have rest, — something very much needed.

Clear-cut Policy Required for Company. — It should not be forgotten, however, that much of the present agitation has developed through the weak policy of the British Empire Steel Corporation and through Federal Government meddling. Again and again the Company has receded and given way just at the moment they should have stood fast. They have had weak men at the helm of the Directorate who have been repeatedly taunted in the public press by the labor leaders for "crawling". This is a most humiliating light to be placed in before their employees and the public. The officials and office staff who had on all occasions loyally stood by their directors and who have helped greatly in the present crisis began to feel that such wobbling tactics could not be continued without loss of dignity, self-respect and a weakening of authority and discipline after each contest was over. One official, reporting his experience, stated that for several years he seemed to have done nothing but turn corners. Now if this large Corporation is to become a success it must have a firm and a clear-cut policy on which it can stand, and when labor disputes arise, each case must be settled on its merits. Too much temporizing and retreating destroys the morale and gives a false impression to workmen of their own strength, encouraging them to flourish the "big stick," as in the present instance.

President Lewis has played his part well, and though in the future there may be times when it might appear he is pressing a hard bargain, there can be no discounting his stand at this time when he has placed honor first and asked the members of his organization to return to work and stand by their agreement. Up to the present all the mainland lodges are with President Lewis, some in Cape Breton have swung into line and while for some time the extreme "Reds" may stand at bay, it may not be the worst that could possibly happen. All's well that ends well.

The Steel Strike.—The strike at the steel plant drags on, but each day sees an addition to the numbers of men at work. From 600 employees who remained on the plant, the number has risen to 1,800, and more

would be employed if the Company were able to put all the departments into operation. There never was any chance of the strikers winning out, and while the leaders tried to minimize in reports the number of men working, it is now beginning to dawn on even the dullest of the strikers that the cause is lost. The leaders still talk wildly of a 100 per cent. strike, and have never given up hope, while each day more men walk into the plant and begin work. Many new men are being hired on, and if the strike continues much longer, not a few steel workers may find that their places are filled and there is no work for them.

The efforts of Premier Armstrong and the Rev. Clarence McKinnon, who went to Sydney to try to negotiate a settlement of the dispute, failed. One thing they did suggest, however, before they left, and that was that a Committee of the striking workmen should be permitted to go to the plant and see for themselves the number of men at work. To this the leaders would not agree, for if they had agreed there would have been a sudden collapse of the strike, when the truth was known.

The coke ovens, the four open-hearths, one blast-furnace, the billet and blooming mills, are all in operation, the last mill working double shift. When the Company are assured of a continuous supply of coal all departments of the plant will be put into operation. The successful operation of the mills, in addition to the loading of coal from the stock piles, and to keeping some of the mines unwatered, has opened the eyes of strikers through the plant to the fact that they are not all-powerful.

BRITISH COLUMBIA

Premier Dividend. — The distribution on the Pacific Coast of the second quarterly dividend of the year to shareholders was commenced by the Premier Gold Mining Co., during the second week of July. It is said it amounted to 8 cents a share on 5,000,000 shares.

Dr. Camsell Discusses B. C. Minerals. — Dr. Charles Camsell, Deputy Minister of Mines for the Dominion, is inspecting mining conditions in British Columbia. His department, he states, is desirous of seeing prospectors direct special attention to mineralized districts adjacent to railways. The tendency is to go too far afield, with the result that nothing but the richest deposits found can be developed. "In the vicinity of the Canadian National, Grand Trunk Pacific and C. P. R. lines in British Columbia there is much ground that could be examined by prospectors, he says. "Being close to transportation, bodies of lower grade ore could be worked profitably whereas at greater distance they would have no present value."

There are seven parties, Dr. Camsell said, operating under the Canadian Geological Survey in British Columbia and the Yukon and, in addition, two topographical surveys are being conducted, one in the Kootenay Park District and the other in the Babine Range section. Dr. Harlan I. Smith, archaeologist and anthropologist, is employed in an examination of the botany and archaeology of the Bella Coola District and Prof. Jenness, who accompanied Stefansson on his Arctic explorations, is in the Hazelton District recording the customs, history, art, language and folk-lore of the Carrier Indians. Another geological party is making an examination of the bentonite deposits of the Provinces of Alberta and British Columbia.

Dr. Camsell visited Victoria while on the Pacific Coast and conferred with Hon. Wm. Sloan, Minister of Mines for the Province, on questions relative to British Columbia's interest, from a mining viewpoint, in the Imperial Economic Conference to be held later on this year in London. Hon. Charles Stewart, Federal Minister of Mines, and Dr. Camsell both plan attending this Conference.

Mr. Albu Discusses Canadian Mines and French Policy. — Leopold Albu, managing director of the General Mining and Finance Corporation of London, England, passed through Vancouver recently en route to Northern British Columbia and Alaskan mining fields. After personally inspecting some mining properties he will return East via California. In traveling westward Mr. Albu examined some of the larger mines of Northern Ontario. His company has extensive mining interests in South Africa, and in speaking of his impressions of this country he said that Canada has all the advantages of South Africa plus the priceless boon of ample water and profuse vegetation.

Capital for the development of mines and other enterprises has become "tight" in London owing to the uneasy feeling prevailing in England because of the turn of affairs in continental Europe, Mr. Albu states. This condition was likely to continue until business men obtained a more definite idea of how matters are going to be adjusted. He speaks very strongly regarding the policy of France stating that "France apparently has embarked on a policy more thoroughly imperialistic than that of the Napoleonic era. To business men her actions seem strangely out of tune with the times and her policy is undoubtedly having a very adverse effect on the post-war recovery of England."

The Outlook of Granby. — Col. J. T. Crabbs, of New York, president of the Granby Consolidated Mining & Smelting Co., after spending five weeks in British Columbia making a personal inspection of the company's plants and properties, and looking into local mining conditions generally, states that he has met with more optimism and a healthier spirit among mining and other business men than he did two years ago. From this he was inclined to think that prosperity was returning. As in the past, the Granby Company was prepared to do everything possible to assist. With the new properties in operation at Allenby the Company would have an annual payroll disbursement of $3,000,000, divided between Anyox, Cassidy and the new plant. Since the Armistice the payroll disbursements had been more than $10,000,000. In addition, capital expenditures of between $4,000,000 and $5,000,000 had been made, much of which had gone into the purchase of local equipment and construction materials. The railway right-of-way from Allenby to Copper Mountain had been damaged by landslides and it was expected that as soon as repairs were effected the new plant would be put in operation. With this mine and plant producing, the Company's annual copper production would total more than 50,000,000 pounds, the greatest single producer of copper in Canada. The company's properties were in good condition, ready to take the fullest advantage of any improvement in the copper market, and the possibilities of such improvement depended largely upon the settlement of the reparations problem in Europe. Four lean years had been bridged. During this period the company had operated at a loss, largely in order that its organization might be kept intact; but better times

were in sight and British Columbia's resources assured her, and those interested in her development, a generous share of the prosperity of the future.

Trail Ore Receipts. — During the first week of the month of July 9,756 tons of ore were shipped to the Trail smelter, Consolidated Mining & Smelting Co. The shipments in detail follow:

	Tons
Alamo, Alamo	47
Bell, Beaverdell	43
Bosun, Silverton	35
Company Mines	9,103
Granite, Taghum	3
Hercules, Burke, Ida	111
Knob Hill, Republic Wn.	54
Monitor, Three Forks	15
Mountain Chief, New Denver	28
Quilp, Republic Wn.	54
Ruth, Sandon	43
Silversmith, Sandon	173
Van Roi, Silverton	47
	9,756

First B. C. Silver Mine Re-opened. — The Eureka-Victoria, a silver bearing property situated near Hope, is being re-opened by A. S. Williamson and associates. This is the first metalliferous mine of which there is record in British Columbia. More than half a century ago it was closed down after operating successfully for some years. A tunnel was driven in the mountain side by the old timers on a rich silver vein and ore carrying high values was extracted. It was "mule-packed" down the Fraser River, shipped to Victoria, thence to San Francisco and finally to England. When the returns were received, amounting, it is said, to several hundreds of thousands of dollars, one of the owners went to Victoria to celebrate and never returned. The owners continued work for a time, but disagreements arose and the workings were deserted. Mr. Williamson states that the equipment has been found just as it was left, bunkhouse, cookhouse, rusted picks, shovels and drills and a dump of ore, not rich enough to pay for handling in the old days, but of value today. The tunnel timbers have rotted, of course, but with their renewal it will be possible to proceed with work where it was left off by the miners of the last century.

Fires at Anyox. — Some alarm was caused in mining circles recently by reports that a large fire was raging at Anyox, headquarters of the Granby Consolidated Mining & Smelting Co. Late information, however, indicates that, although the town and plant have been threatened by bush fires of considerable extent, the flames are under control. It is gathered that there has been some slight interference with the Company's operations but that a timely heavy rain came to the aid of the fire fighters before the condition became serious.

Exploration of Sultana Group. H. S. Munroe, general manager of the Granby Consolidated Mining & Smelting Co.; J. A. Bancroft, geologist; and E. J. Conway, mining engineer, have returned to the Coast after making an examination of the Sultana Group, which was bonded by the company some two or three months ago. There are showings of grey copper and silver bearing ore and exploratory work is to be undertaken immediately.

Silversmith Report. — The annual report of the Silversmith Mines Ltd., Sandon, just issued, is very interesting. It covers the period June 1, 1922 to May 1, 1923, and shows a cash balance of $94,337.15; government bonds on hand totalling $50,000; ore in transit $25,031.05 and ore on hand, $20,631.10. The gain for the year is said to have been $254,366.59. Dividends paid totalled $125,000 and there is $85,601 in surplus account. John B. White, president, in his report, states that the new mill and other improvements have been completed and that there should be no further capital outlay that will interfere with the payment of dividends. Operations include 52 feet of cross-cutting, 894 feet of drifting and 147 feet of raising. Clean ore, mined from stoping, totalled 522 tons and mill feed ore mined 34,843 tons. The average assay of the mill feed had been 24.02 ounces silver, 8.92 per cent. lead and 7.60 per cent. zinc. A 200 h.p. Diesel engine has been added to the power equipment as an auxiliary for use when the water is low in the winter.

Cork Province. — Drifting is in progress on the new ore-body struck in the Cork Province Mine, and the mill is to be operated 16 hours a day. Two carloads of concentrate have been produced, containing about 60 per cent. lead and 40 to 45 ounces of silver to the ton.

Yukon's Silver Output to Increase. — Captain George Black, M.P., discussing mining conditions in the Yukon Territory, which district he represents in the Dominion House of Commons, said that the placer industry was practically worked out but that silver mining was in its infancy. Two big mining companies already had invested heavily and other capital was going in this year, to his certain knowledge. Transportation companies, which handled 9,000 tons from Mayo this spring, were preparing to handle 25,000 tons next year. The government was putting in wireless stations at Mayo and Dawson and building roads to the mines. The White Pass & Yukon Railway was investing largely in the work of damming up the lakes that feed the Yukon River in order that water may be so released as to maintain an even flow for navigation.

Coal Production for June Up.—The coal production of British Columbia for the month of June totalled 186,160 tons, an increase of 23,848 tons over the output for the previous month. The collieries of Vancouver Island produced 129,616 tons last month which is 32,252 tons in excess of that for May. It is clear, therefore, that the coal business has been improving on the Coast and falling off in the interior. Greater mercantile activity, it is said, accounts for the growing strength of the coal market on the Coast. This should be felt most when the shipment of wheat via the Panama Canal begins, because there are few of the ships handling grain that are equipped for the consumption of oil. At any rate the present prospect, as far as the Island collieries is concerned, is encouraging. If the demand holds during the summer many operating difficulties will solve themselves automatically.

The Nicola Princeton Field, also, shows a slight increase in production, one thousand odd tons, for which the Middlesboro and Coalmont Collieries are largely responsible. In the Crow's Nest Pass Field there was a drop of 9,507 tons in the production for June as compared with May. The Coal Creek Colliery fell off 8,694 tons, that at Corbin 954 tons while the Michel Colliery increased its output 141 tons. The poorer showing in this section of British Columbia no doubt is accounted for by the barrier created by the Fernie

Tariff, making export to the United States at a profit practically out of the question, and the lack of demand in the middle west.

Competition at Blairmore. — A Mine Rescue Competition was held at Blairmore, Alberta, on July 2nd and 3rd under the joint auspices of the Mines Department of the Province of Alberta and the Rocky Mountain Branch of the Canadian Mining Institute. In addition to the Mine Rescue and First Aid contests for men, there were prizes for the best First Aid demonstrations by ladies (individually, and in teams) and a shield for Juvenile Competitors. In the Mine Rescue Competition there were eight teams from Alberta while British Columbia was represented by four teams, viz., Coal Creek; Fernie No. 1; Fernie No. 2; and Michel. Each team was given a different problem of a practical nature, such as may easily occur in a coal mine, involving the use of a breathing apparatus and a knowledge of First Aid and the work of the various teams clearly demonstrated the value of constant training with the apparatus in conjunction with organized team work.

The work of the competing teams was appraised as follows:

1st Place — Michel Team, B.C., and Hy Grade (Draw).
3rd Place — Fernie No. 2 Team.
4th Place — Bellevue No. 3 Team.
5th Place — Nordegg Team.
6th Place — Fernie No. 1 Team and Coal Creek Team (Draw.)
7th Place — A. B. C. Team Drumheller.
9th Place — Bellevue No. 1 Team.
10th Place — Blairmore No. 1 Team.
11th Place — Blairmore No. 2 Team.
12th Place — Lethbridge Team.

Much interest was shown in this competition as Blairmore is the main town of the Crow's Nest Pass District of Alberta.

The judges in this competition were: Messrs. Horne McDonald, Howell, and Cranston, Inspectors of Mines, Alberta, and Messrs. H. E. Miard and James Dickson, Mines Department, B. C.

The showing of the Fernie and Michel teams in taking two prizes in the first three indicates that a high standard of efficiency is being maintained in the use of Rescue Apparatus in British Columbia.

Poland has the largest known deposits of ozokerite, or mineral wax, in Europe. Last year the output was 430 tons, against 260 tons for 1921, this constituting the bulk of the world's supply. It is used locally to mix with lighter paraffin waxes in the manufacture of candles. Most of it is used as an electrical insulator in admixture with india-rubber. It occurs in veins, somewhat like the albertite of New Brunswick.

Chester B. Hamilton Jr., B.A. Sc., M.E.
M.E.I.C., M.A.S.M.E., M.S.A.E.

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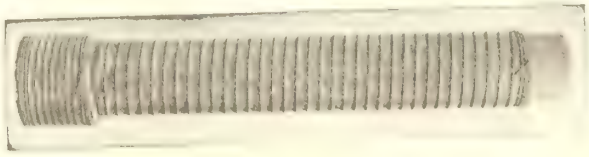
Two (2) Dorr Slime Thickeners
Ten (10) Deister Concentrating Tables
Two (2) Wilfley " "
and much miscellaneous equipment

Apply Mutual Chemical Co. of America, Black Lake, P. Q.

Wood Mining Tanks
OF ALL DESCRIPTIONS
Wood Stave Pipe



Pacific Coast Pipe Co., Limited
1551 Granville Street, Vancouver B.C.

Ontario's Minerals

PROVINCE OF ONTARIO

DEPARTMENT OF MINES

Hon. H. MILLS, Minister of Mines

Mineral Areas.

Ontario, with its 407,262 square miles, contains many millions of acres in which the geological formations are favorable for the occurrence of minerals, 70 per cent of the area being underlain by rocks of pre-Cambrian age. The phenomenally rich silver mines of Cobalt occur in these rocks; so also do the far-famed nickel-copper deposits of Sudbury, the gold of Porcupine and Kirkland Lake, and the iron ore of Magpie and Moose Mountain mines.

Economic Minerals.

In addition to the above, practically all economic minerals (coal and tin excepted) are found in Ontario:—actinolite, apatite, arsenic, asbestos, cobalt, corundum, feldspar, fluorspar, graphite, gypsum, iron pyrites, lead, mica, molybdenite, natural gas, palladium, petroleum, platinum, quartz, salt, talc and zinc. This Province has the largest deposits on the continent of talc, feldspar, mica and graphite.

Building materials, such as ornamental marble, limestone, sandstone, granite, trap, sand and gravel, lime, Portland cement, brick and tile, meet every demand.

Mineral Production.

Preliminary returns show the output of the mines and metallurgical works of the Province for the year 1921 to be worth $48,128,387,of which the metallic production was $27,574,202.

The following figures show the rapid growth of Ontario's mineral industry by five-year periods since 1891:

Year.	Value.	Year.	Value.
1891	$4,705,672	1906	$22,388,383
1896	5,235,003	1911	41,976,797
1901	11,881,086	1916	65,308,822

Dividends.

Dividends and bonuses paid to the end of 1921 amounted to $23,140,734 for gold mining companies, and $84,388,185 for silver mining companies or a total of $107,528,919.

Mining Regulations.

A miner's license costs $5.00 per annum, and entitles the holder to stake out in any or every mining division three claims of 40 acres each. After performing 200 days' assessment work on a claim, patent may be obtained from the Crown on payment of $2.50 or $3.00 per acre, depending on location in unsurveyed or surveyed territory.

Assay Office.

The Provincial Assay Office at No. 5 Queen's Park, Toronto, is maintained by the Department of Mines for the free identification of minerals, free assays under the provisions of the Mining Act of Ontario, and also for general assay work as per the Schedule of Charges which may be obtained on application.

Temiskaming Testing Laboratories

The Department maintains, at Cobalt, an ore sampling and testing laboratory which is now prepared to receive parcels of gold ore from 100 pounds upward, and after sampling and assaying the same to pay to the shipper the value thereof, less treatment charges. The purpose is to afford a market for ores extracted by prospectors and others in developing their mining claims, enabling them to obtain funds which they can use for further work and to report on the most satisfactory method of treatment. Fuller information may be obtained on application to the Manager, Temiskaming Testing Laboratories, Cobalt, Ontario.

Publications.

For list of publications, illustrated reports, geological maps and mining laws, apply to

THOS. W. GIBSON,
Deputy Minister of Mines.
TORONTO, CANADA.

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HOSE { "Gibraltar" Air Drill

PACKING { High-grade Packing for all purposes.

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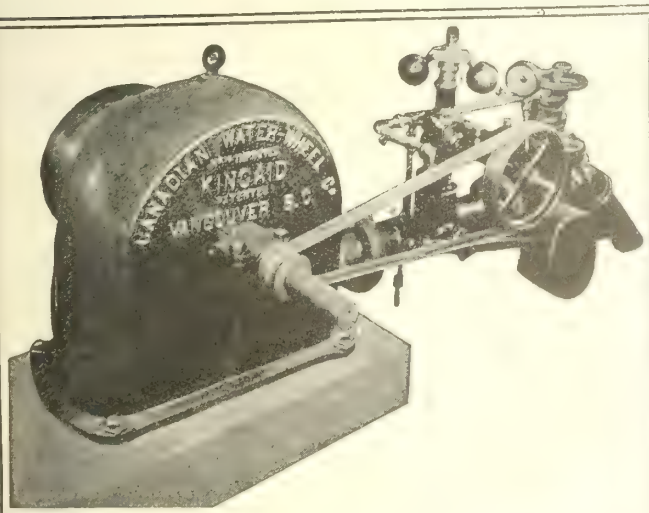

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The "KINCAID" water-wheels deliver the full theoretical power calculated from a given quantity of water from a stated head.

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CANADIAN WATER WHEEL CO., Ltd., Vancouver B.C.
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"Every man owes some of his time to the upbuilding of the profession to which he belongs"
—Theodore Roosevelt

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AMERICA'S MOST IMPORTANT INDUSTRIAL EXPOSITION

is assured, and there is every indication that this year's Exposition will be the greatest of its kind in the country, if not in the world.

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One of the important features will be the presentation of ways and means to enhance labor productivity. The utilization of waste products will also be given special attention.

Exhibitors are making elaborate plans to have this year's exhibit surpass any showing made during previous years.

For further information address National Exposition of Chemical Industries, Grand Central Palace, New York.

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BRITISH COLUMBIA

The Mineral Province of Western Canada

Has produced Minerals valued as follows Placer Gold, $76,542,203; Lode Gold, $109,647,661; Silver, $59,814,266; Lead, $51,810,891; Copper, $170,723,242; Zinc, $24,625,839; Coal and Coke, $238,289,565; Building Stone, Brick Cement, etc., $36,605,942; Miscellaneous Minerals, $1,358,839; Making its mineral production to the end of 1922 show an

Aggregate Value of $734,259,619

The substantial progress of the Mining Industry of this Province is strikingly exhibited in the following figures, which show the value of production for successive five-year periods: For all years to 1895, inclusive $94,547,241; for five years, 1896-1900, $57,605,967; for five years, 1901-1905, $76,509,968; for five years, 1906-1910, $125,534,474; for five years, 1911-1915, $142,072,603; for 5 years 1915-1920, $189,922,725; 1921, $28,066,641; for the year 1922, $35,158,843.

Production During last ten years, $339,280,940

Lode-mining has only been in progress for about twenty-five years, and not 20 per cent. of the Province has been even prospected; 300,000 square miles of unexplored mineral bearing land are open for prospecting.

The Mining Laws of this Province are more liberal and the fees lower than those of any other Province in the Dominion, or any Colony in the British Empire.

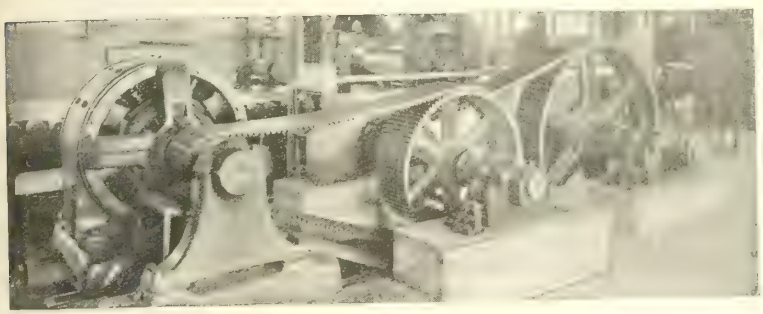
Mineral locations are granted to discoverers for nominal fees.

Absolute Titles are obtained by developing such properties, the security of which is guaranteed by Crown Grants.

Full information, together with Mining Reports and Maps, may be obtained gratis by addressing

VICTORIA, British Columbia
THE HON. THE MINISTER OF MINES,

MORSE CHAINS



A few of the Morse chains in use at the Raymond Lead plant

Using chain drives speeds up production, cuts belt expense and overtime wages and operates with practically no repairs.

Write for Booklet

CANADIAN AGENTS

Jones & Glassco, Regd.

MONTREAL, TORONTO.

O. W. Ludwig, *Plant Superintendent of the Raymond Lead Co., Chicago, says:*

"Thirteen years of service without a repair is our experience with two 100 H.P. and ten 20 H.P. Morse Silent Chain Drives.

"When we moved into our present plant thirteen years ago, we installed the present Morse equipment of silent chains for our two lead mills and ten hydraulic pumps. We had always previously used leather belts, but not without considerable trouble. For instance, if the operator was not careful — and gave the motors too great a load, the leather belt would slip and in some cases burn out. While with the Morse Chain Drive we overload them at times up to 15 H.P. without the slightest trouble.

"When we used leather belts on the hydraulic pumps, if a pump packing suddenly gave way, the water would squirt all over the pump as well as adjoining pumps, causing the leather belts to get wet. This often necessitated a shut-down on 3 to 4 pumps to dry out each belt, thus causing a loss of time by the men, which resulted many times in paying overtime to catch up on the work. Of course, with our Morse Chain Drive we have no such trouble—this positive drive prevents slippage and is not affected by water.

"Leather belts lasted us 2 to 3 years at the most, while our Morse Chain Drives have already lasted 3 to 4 times that long and seem good for many more years. So Morse Drives have cut our expense materially, speeded up production, cut out overtime wages and saved floor space, for they operate on shorter centers."

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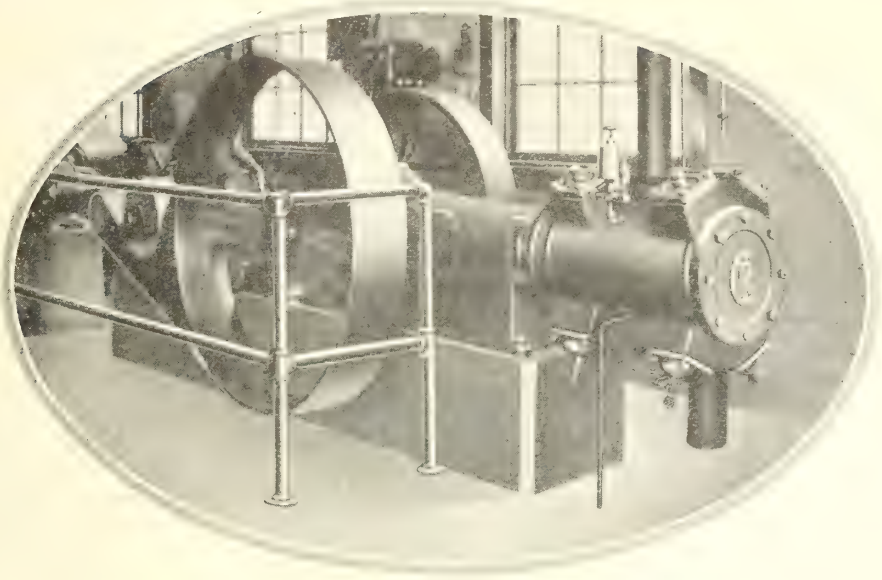

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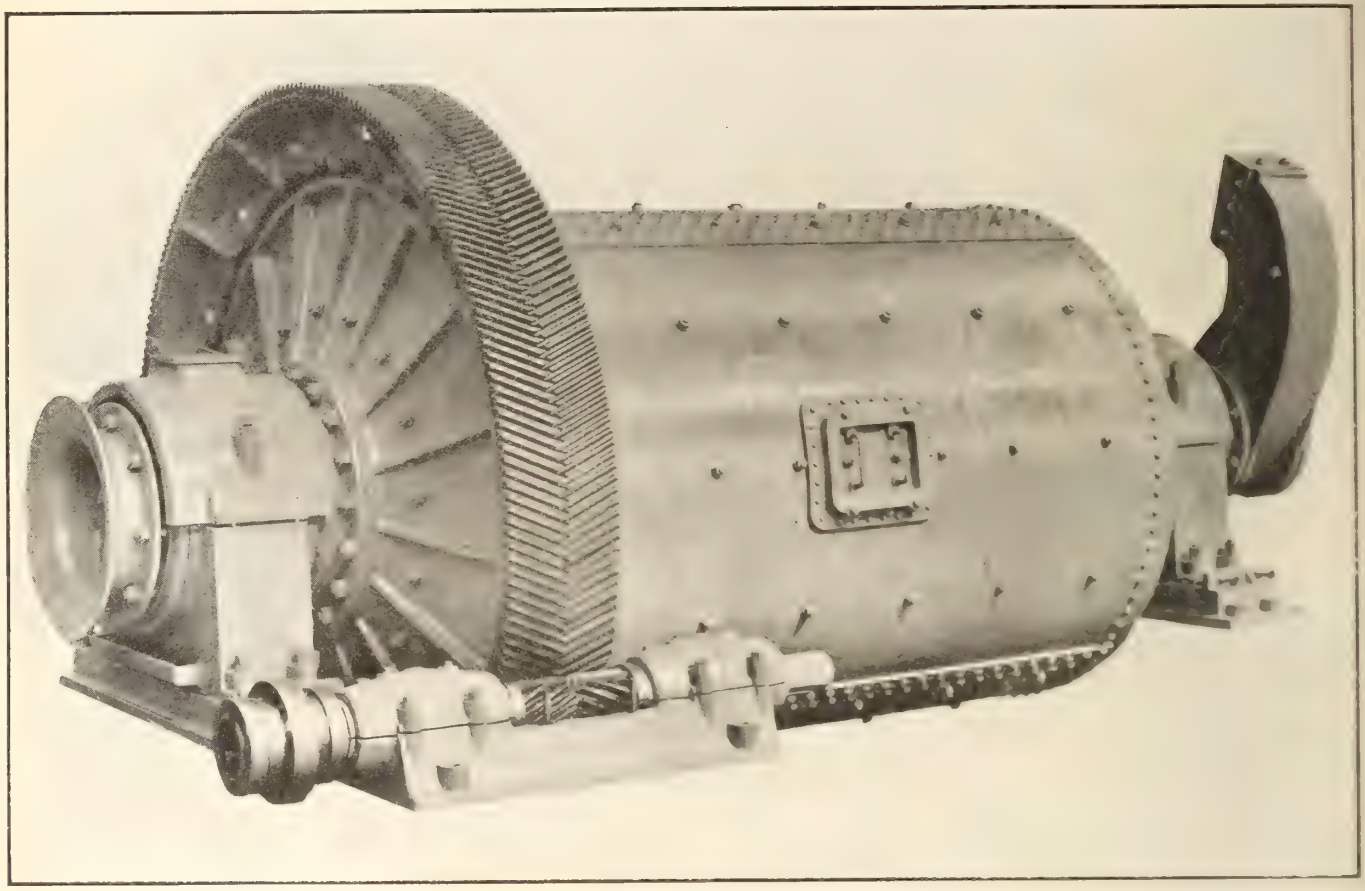

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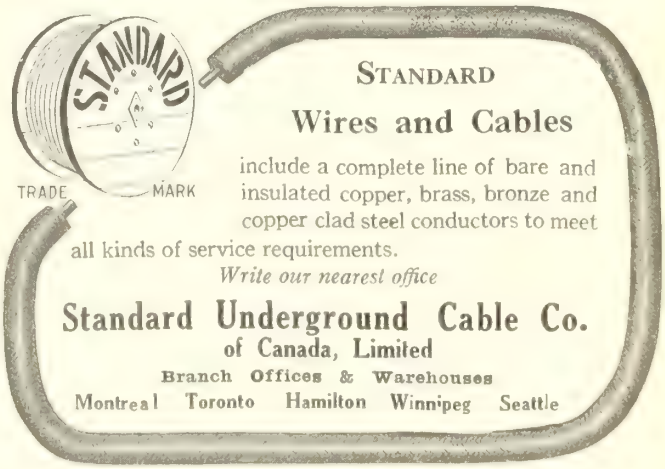

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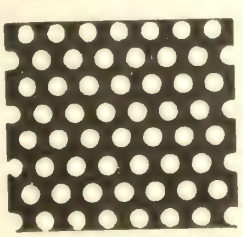
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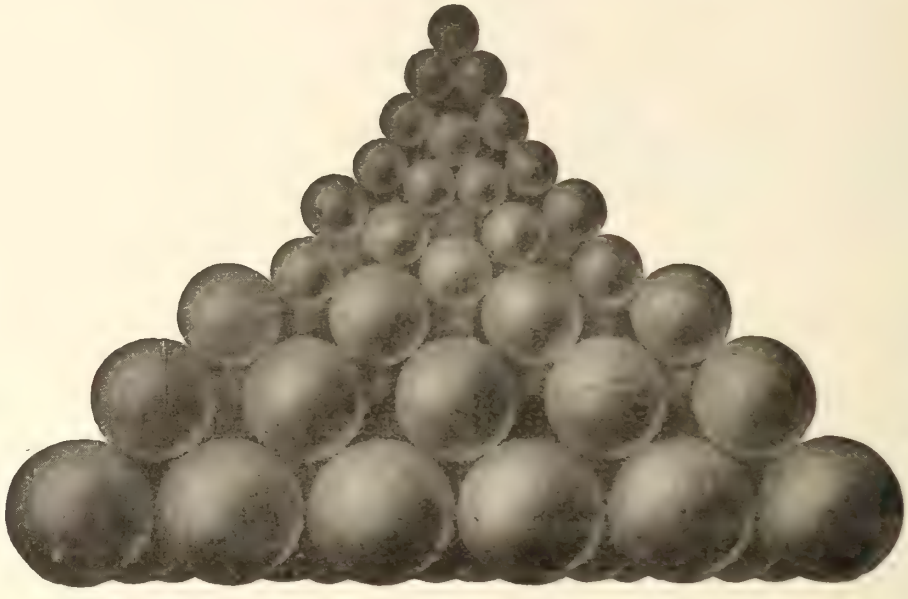

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CANADIAN MINING JOURNAL

PUBLISHED WEEKLY

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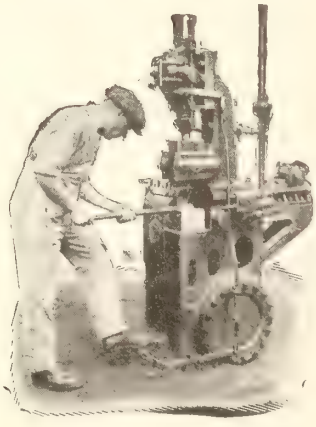

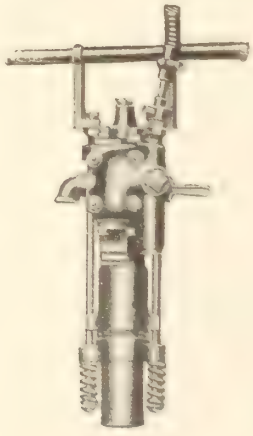

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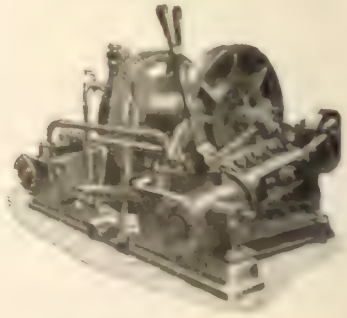

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:-: EDITORIAL :-:

ASSESSMENT WORK AND MINE TAXATION

The new Premier of Ontario already is showing an active interest in the province's mineral resources. The de-centralizing of the government offices to the extent of appointing Mr. F. H. Keefer as resident representative in Port Arthur is an experiment whose progress will be followed with interest by mining men. The three hundred mile stretch of mineral-bearing land from Nipigon to Kenora of which Port Arthur is the natural centre constitutes one of the chief potentially productive areas in Ontario. For a variety of reasons, its exploration has remained incomplete and attempts to develop it have been unsuccessful. It still remains a promising field for honest and well directed effort. We hope that Mr. Keefer may succeed in aiding this effort.

Mr. Ferguson has announced that his government is prepared to examine, and if necessary modify, the regulations in the Mining Act dealing with assessment work, with a view to stimulating the active development of mining claims. It is a debatable question whether an addition to the present annual requirement of assessment work would aid or retard exploration. Advisers of the late Government made the existing regulation in an honest attempt to effect the very end Mr. Ferguson desires. There is one point in connection with the assessment regulations, however, on which most real prospectors and mining men will agree, and which well warrants the Premier's attention. A vast amount of assessment work is sworn to in the recording offices that has not been performed. From our own experience we would judge that non-resident owners, particularly amateur prospectors and those that take a "flier" on a mining claim or two and hold them "on spec..," are those most often guilty of perjury in this connection. Genuine prospectors and mining men, upon whom depends almost entirely the progress of the mineral industry, usually do their assessment work before they swear to its performance. It is up to the provincial government and the public officials to see that all conform to the law.

Another point in the present mining regulations that might well engage the attention of Mr. Ferguson and his associates is an anomaly in the taxing of mines. During the hey-day of wartime prosperity the nickel mines were singled out for special taxation.. This we consider to be now an injustice, whether or not it was so at that time. The managements and directorates of the nickel companies have an enviable record of war service. They continued to produce and sell an essential war material at substantially the pre-war prices, and re-invested part of their profits in additional plant to provide the larger output required, with the full knowledge that it would be virtually useless after the war. They neither asked nor received the subsidy that induced many to contract similar obligations in other lines. The effort toward post-war rehabilitation of an industry cut off from the larger part of its former market has been remarkable, and admirable. We suggest that Mr. Ferguson examine into this case closely, and we recommend that justice, even though tardy justice, be done the nickel companies.

"FAR-AWAY FIELDS—"

Canada has vast unprospected areas. Few realize what a substantial percentage of these areas lie close to railways and navigable water routes. The search of the prospector is conducted ever outward and onward, to new fields and the unmapped wilderness. The spirit of adventure that stimulates the search on the outskirts should be encouraged by every possible means, that the boundaries of our settlements may be extended. But the near-by mineral areas should not be neglected.

Last week our British Columbia correspondent quoted Dr. Charles Camsell, Deputy Minister of Mines at Ottawa, as saying that his department wants to see prospectors direct special attention to mineralized districts adjacent to railways. The tendency is to go too far afield, with the result that only the richest deposits found can be developed. "In the vicinity of the Canadian National, Grand Trunk Pacific and Canadian Pacific lines in British Columbia there is much ground that should be examined by prospectors," said Dr. Camsell. "Being close to transportation, bodies of lower grade ore could be worked profitably, whereas at a greater distance they would have no present value."

This is a good tip to those prospectors with whom the desirability of making a profitable "find" outweighs the undoubted attractions of exploration far afield. There are numerous mineralized areas in Nova Scotia, Quebec, Ontario and British Columbia that are intersected by or close to railways that have had, in general, only the merest superficial examination. Most of them have been the scene of a "boom" that accom-

plished little or nothing in the way of exploration or mining development, but left a legacy of blasted hopes, distrust and discouragement. In some of these areas a large part of the ground formerly held as claims by private owners has reverted to the Crown for non-payment of taxes. Some of the properties still held by private owners can be obtained from them on reasonable terms. One can say, in general, that, unless they are known definitely to have been explored thoroughly, these old-time mineral areas are the best prospecting ground in Canada.

FEDERATION OF BRITISH INDUSTRIES AT EXHIBITION

The spirit of Empire development is in the air these days, and numerous means are being evolved to put it into material form. This month there will be exemplified, in Toronto, a very practical means of developing Empire trade. The Federation of British Industries will have important exhibits at the Canadian National Exhibition for the first time. The move is somewhat in the nature of an experiment, and if successful it is intended that the exhibits of succeeding years shall be increased in scope and magnitude. The exhibitors are, of course, almost exclusively manufacturers; but as these must have raw materials, many of them imported into Great Britain, to conduct their business, Canadian producers of raw materials, including minerals and metals, may find in the Exhibition of 1923 a convenient and useful means of enlarging their British connection.

The sudden rise of the Federation of British Industries is one of the romances of British commerce. It was founded in 1916 by a small group of prominent manufacturers who realized the necessity for some organization to coördinate the interests of, and represent, all the industries of the United Kingdom. The original idea of its founders was to enable manufacturers in the United Kingdom to take immediate advantage of commercial opportunities overseas, following the conclusion of the great war.

Once begun, the Federation grew so rapidly that at present it is the largest and most powerful organization of manufacturers and raw material producers in the world. Its membership includes all the important trade associations in the United Kingdom, over 120 in number, while altogether its total direct and indirect membership includes more than 19,000 manufacturing establishments, representing $25,000,000,000 in capital. In addition to its head office in London, it maintains sixteen district offices, each in charge of a resident secretary, in the principal industrial cities of Great Britain and Ireland.

In this initial appearance at the National Exhibition in Toronto, twenty British firms have arranged for large exhibits and thirty more will show their goods on a smaller scale. A number of these exhibits will be of direct interest to mining men — for example, steel, mining machinery, firebrick and scientific instruments. More important, however, will be the opportunity presented for personal contact with the responsible representatives of the British firms. Britons and Canadians have common interests that are bound to be forwarded by personal acquaintance gained in such a way as this.

We hope that this attempt to aid the development of Empire trade will be so fruitful of practical results as to encourage an annual British exhibit of increasing size and importance at our Canadian National Exhibition.

STATE PROSPECTING

State-aided enterprises are more the vogue in Australia than in any other part of the British Empire. A new departure, recently described in the report for last year of the Western Australia mines department, is prospecting by public officials. The gold industry of Western Australia has declined so seriously that this expedient has been adopted in an attempt to revive it. A party of nine men qualified to conduct a search for minerals was kept in the field last year, and the result was so encouraging that the State government has repeated the experiment again this year. The idea is virtually that the work of these public servants will provide sufficient information to stimulate a "rush" of prospectors and miners.

In Canada we have developed virtually this same expedient, though we call it by a different name. Our provincial and federal Departments of Mines have the prospector and his work continually in mind. The Geological Survey, particularly, has laid itself out to direct the energies of the prospector. As the preliminary areal mapping of the country is now to a large extent finished within economic distances of the railways and navigable water routes, the attention of the geologists is being directed more and more to the areas likely to be productive of mineral wealth. These are mapped in more detail and their geological problems studied and solved, and in every report on such an area made during recent years the prospector will find directions for his guidance that he can understand and follow.

The Ontario Department of Mines has likewise a close *liaison* with the prospectors. Its geologists, working principally in areas where an intensive search for mineral deposits is already in progress, come into close personal contact with the searchers, with a result that is mutually beneficial and that adds much to the efficiency of the prospector's effort.

Thus, though we have in Canada no state prospecting under that name, we have, in our geologists, a

corps of men working with good effect to aid and abet the search for minerals. Though they are only a handful, scattered from Atlantic to Pacific, their influence on the mineral industry is remarkable. Working cautiously, steadily and with the full force of scientific knowledge behind them, this little band of public servants accomplishes a result each year quite out of proportion to their numbers, and more nearly in accord with the zeal for progress and the thirst for still further scientific knowledge that is their outstanding characteristic.

SEVEN DOLLAR RATE ON ALBERTA COAL

Little publicity has been given the conference in Edmonton last month, between representatives of the railways and coal operators, under the auspices of the Government of Alberta. Their object has been to "get together" with a view to determining the minimum rate at which it is possible to haul Alberta coal to Ontario. Apparently the conference has been at least partially successful. A press despatch from Edmonton states that on July 26th fifty cars of Drumheller coal was shipped over the Canadian National lines to Ontario "under the new agreement between the Government and the railway authorities, the coal going forward at the temporary freight rate of $7.00 per ton."

This is good news. Evidently the railway men have conceded the fact that their former announcement of a $9.00 freight rate is susceptible of revision, and that under the circumstances it is worth while to determine by actual trial the cost of shipping the coal in trainload lots. The season is now so far advanced that these experimental shipments can be sent forward during only the few short weeks that remain before the wheat crop commences to move eastward; but it is highly satisfactory to know that, following the manoeuvering that has been in progress since last spring, those concerned have agreed upon a basis for action.

After these experimental shipments have been made, it will still remain to determine whether or not it is economically feasible to reduce the cost of hauling by the use of specially designed rolling stock. It seems possible that in the case of coal, which can, if necessary, be shipped steadily throughout the twelve months of the year, such special equipment might be justified. The data accumulated as a result of the shipments already arranged for will, we hope, point the way to further progress in the direction of independence in fuel needs.

AIRPLANE AIDS SURVEYS

The Geological Survey has been conducting an important experiment in conjunction with the Air Board since last year. The use of aerial transportation and aerial observation in helping to solve the field geologist's problem is receiving a thorough trial. Last year supplies were to have been taken in to a topographical survey party in a far distant part of Northern Manitoba. The attempt was only partially successful; but no serious consequences ensued. This year the attempt has been renewed, with more success. Dr. J. T. Wright, who is in charge of the survey party in the Rice Lake gold and copper-nickel area east of Lake Winnipeg, has received a shipment of supplies from Victoria Beach, the flying base on Lake Winnipeg. Mr. R. C. McDonald, who is making a control survey of part of the vast unmapped area north of The Pas, will have received supplies by airplane by this time. It has been planned also to take the geologists up in the air, to observe the topographical features of the ground they must cover on foot and by canoe, and also to provide them with oblique photographs of the area. This direct observation, supplemented by sketches, in conjunction with the photographs, which cover a wide area when the view is oblique, will aid the surveyers very materially; while the supplies, brought hundreds of miles in a day, will save weeks of work on the portage routes.

This is a very important development in the surveying of our unknown hinterlands. The time and expense involved in the present methods of mapping impede its progress. The mapping is the first step in exploration and commercial exploitation. If the use of the airplane will hasten and cheapen the surveying of our northland, we shall benefit the more rapidly from the natural resources it contains.

THE ENGLISHMAN

Then and Now

Time was when, weirdly clothed and garbed,
He roused our caustic comments, barbed
With adjectives unkindly.
Equipped with bath-tub and with guns,
He was the type of Albion's sons
Who went it blindly.
His speech was strange, his manners bad;
He was an unengaging lad,
For work unfitted.
Lo! Time a miracle has wrought:
The Englishman has taken thought,
Has pretermitted
His lofty, irritating mien,
And (stranger thing has never been!)
Will, as a sequel,
Some day, that has not dawned as yet,
Treat us Canadians, I bet,
As quite his equal!

J. C. M.

Plans to Make Gold-Wealth of Ontario Known to the World

Interview with the Hon. Howard Ferguson, who intends practical steps shall be taken to assist development of the gold-mining industry, accorded to Mr. Howard Bridgewater, Director, The Porcupine-Davidson Gold Mines

Mining men throughout this Province, and many in the Old Country, will be gratified to learn that it is the intention of Ontario's new Premier that active steps shall be taken to make known to the world — and particularly to the financiers and investors of Great Britain — the wonderful opportunities for the profitable investment of capital that awaits enterprise in connection with the development of Ontario's gold resources. American and English mining engineers who have visited the goldfields of Porcupine and Kirkland Lake, to say nothing of the other promising districts such as West Shining Tree, Matachewan, Lightning River, Matheson and Larder Lake are enthusiastically agreed that not only is Northern Ontario one of the richest known mineral areas of the world, but that its gold-fields bid fair in time to rival even the Rand, the greatest gold-field the world has known.

According to so eminent an authority as Mr. C. V. Corless, mining is Canada's greatest future industry, and her future greatness rests therefore more upon the extent to which her mineral resources are developed than upon any other factor. In his Presidential address to the Canadian Mining Institute (delivered in March of last year) Mr. Corless said: —

"We live in a country whose greatest permanent material sources of wealth are its soil and its minerals. Few people realize however that not more than 15% of its entire surface is suitable for profitable cultivation. ...I shall endeavour to show that the remaining 85% contains mineral treasures of inconceivable value."

No one will gainsay the fact that the greatest need for capital in Ontario exists in connection with the further development of the gold-mining industry. Not only can we point to a mine in the Province field, the Hollinger, which is the greatest individual gold-producer in the world, and to others that may quite possibly rival it in importance, but we can point to the fact that of the many mines in the development stage, results have in numerous cases justified deep working, both in the Porcupine and Kirkland Lake fields. And we can point further to the fact that the geological structures favourable to the formation of workable deposits have been proved by Government geologists to extend for a distance of upwards of 100 miles across the border into Quebec.

Conditions are probably more favourable to mining operations here than they are in any other quarter of the globe, working costs comparing favourably even with those of the old-established Rand mines, despite the advantage the Transvaal has in its supply of cheap "native" labour.

Asked to express his views on this subject, Mr. Ferguson said: — "You may tell your readers that the new Government, over which I have the honour to preside, is fully alive to the importance of vigorously developing the mineral, and in particular, the gold-wealth of Ontario. The main need of our gold fields is capital for their development. We undoubtedly have the mineral wealth and it is the intention of the Government to let the world know. Up to now private enterprise has had little assistance from Government, little or no attention having been paid to representations from London mining houses concerning the need to familiarise the British investor with the present and prospective gold-wealth of the Province. Amongst the many and various proposals that are receiving consideration is one to invite representatives of the leading British newspapers to visit the gold fields of Ontario as guests of the Government so as to give them the opportunity of seeing for themselves not only what has been accomplished, despite many difficulties that no longer exist, but what yet remains to be done. This proposal is now receiving sympathetic consideration. The results of such a visit would, I am convinced, be so important as to render the expense incurred scarcely worth consideration.

"Of the other proposals that have been brought to my notice, I would prefer not to say more at present than that they will all receive the close and careful attention they merit. Conditions for gold-mining are nowhere more attractive than they are at present in Northern Ontario; it remains for us, therefore, to see that their attractions are made known. Our light will no longer be hid beneath an agricultural bushel!"

NEW PROCESS FOR MAKING ALUMINIUM

A patent has recently been taken out in Germany for a new method of manufacturing aluminium, whereby clay is mixed with pyrites and heated to about 500° C. On continuous calcination, in a stream of chlorine gas evolved from sodium chloride, with the addition of carbon, the resulting reaction-product decomposes into aluminium chloride, which is then mixed with sodium chloride, to which are added potassium chloride and small quantities of strontium chloride. Transformation into metallic aluminium and chlorine gas is then effected by the usual thermo-electrical means. No cryolite is used, nor is it necessary that the clay should have a fixed proportion of silicic acid present. Moreover, in this process the chlorine gas necessary to form the aluminium chloride is not wasted.

Another patent has been taken out to recover aluminium from laterite iron ores such as are found, for example, in Greece, containing relatively high percentages of aluminium. The latter, on the ore being smelted, passes into the slag and is lost. Under the new process, the ores are subjected to a reducing pre-treatment, such as heating the finely-ground ore under exclusion of the atmosphere to high temperatures in order to bring the colloidal oxides into a suitable form for reduction. When this has been effected, the actual reduction is done by passing reducing gases over the said oxides. Both heating to these high temperatures and reduction can be done simultaneously by passing a reducing gas, say water-gas, over the mass of ore. The reduced mass then contains the metallic iron in a state of fine division, and it can be removed by magnets, leaving the remainder to be worked up into aluminum. — "Aluminum"

The Collieries of British Columbia

IV. — Canadian Collieries (D), Cassidy, and Nanoose-Wellington

By ROBERT DUNN

The largest producer of coal in British Columbia is the Canadian Collieries (D) Ltd. Its output in 1921 was 736,480 tons. The Crow's Nest Pass Coal Co. Ltd. runs it a close second with 691,824 tons in the same year and, as has been noted, the Western Fuel Corporation is not far behind; but the Canadian Collieries holds the palm. This company has easily the greatest extent of coal lands on the Island. In June 1910 it acquired by purchase all the Dunsmuir interests. These interests comprised the coal of the lands of the Esquimalt & Nanaimo Ry. Belt that had not been alienated prior to the year 1884. In that year the Settlement Act was passed, which conveyed to the E. & N. Ry. Co., the chief promoter of which was the late Robert Dunsmuir, the block of land known as the E. & N. Belt, together with the under-surface rights, including coal and base metals. Some settlers subsequently were able to obtain the coal on lands within that area under the Settlers' Rights Act of the Province of British Columbia, their title being secured by reason of their showing that their holdings came to them direct from settlers who located before 1884. A few such grants were transferred by purchase to the Granby Consolidated Mining & Smelting Co., which explains the ownership of the Cassidy Collieries. Substantially, however, the Canadian Collieries (D) Ltd. hold the entire Dunsmuir coal rights on the Island and since entering into possession in 1910 large expenditures have been made in developing and improving the property.

Surface Plant at No. 4 Mine, Cumberland, B. C., Canadian Collieries (D) Ltd.

The Ladysmith Field

The Canadian Collieries' operations are divided into two distinct fields. The more southerly of these is Ladysmith. It consists of Nos. 1, 2, 3 and 5 Mines, the first three being located at Extension, about eleven miles from Ladysmith, and the last at South Wellington, a point on the E. & N. Ry. about nine miles north of Ladysmith. The product of the Extension Mines is carried to Ladysmith, the shipping centre, by means of a standard gauge railway, while the South Wellington coal is transported over the E. & N. Ry. There is a central tipple at Extension through which goes the coal of the three mines, which are connected by a main tunnel. Electric locomotives take care of the haulage and the pillar and stall system is used. The main washery is at Ladysmith, adjacent to the shipping piers, and facilities are maintained for both large ocean-going vessels and local business.

The Comox Field

In the second field at Comox, there are five mines, viz., No. 4 Slope, No. 5 Shaft, No. 6 shaft (not operating) No. 7 Slope (abandoned) and No. 4 Shaft (not operating). There has been constructed here one of of the largest and most modern hydro-electric plants in the Province. The power house is located on the Puntledge River about three miles from Cumberland. The generating units are as follows: two Francis R turbines direct connected to two Canadian General Electric generators with an installed capacity of 12,000 h.p., accommodation being available for an additional installation of 12,000 h.p. Power is carried to sub-stations located at each mine, as well as the shipping docks and the main shops at Union Bay. The towns of Courtenay and Cumberland secure power for lighting and other purposes from the company's plant. Several of the rural communities are similarly served. The mines are equipped with the latest type electrical hoisting equipment and, while longwall mining has been the practice where conditions seemed to warrant it, the pillar and stall system is that generally in use. The shipping point for Comox coal is Union Bay, at the head of Baynes Sound. At this point the Company have large shipping docks equipped with electrically-driven conveyors and other loading facilities. A modern washery and coal preparation plant is also located adjacent to the shipping docks. At Union Bay are the general shops consisting of machine, car, foundry, blacksmith, and carpenter shops. A standard gauge railway connects the mines and Union Bay, and it may here be noted that, although the mines are

only four miles from tidewater, the railway is some eighteen miles in length, having to adopt a circuitous route in order to obtain a good grade. The motive power consists of five steam locomotives ranging from 40 to 71 tons, 50-ton steel hopper cars being used for transporting coal. A regular passenger and freight service also is maintained, connection being made with both E. & N. Ry. Company trains and the Canadian Pacific Ry. boats. A battery of 200 beehive coke ovens is located at Union Bay.

Personnel of Canadian Collieries (D)

J. M. Savage is the general manager of the Canadian Collieries, with headquarters at Victoria. The general superintendent is Thos. Graham, while at the Wellington-Extension Colliery, Thomas A. Sprunston is the superintendent. At Comox the district superintendent is Charles Graham. The development of the coal areas under the company's control in a broad way, looking to the future and providing intelligently for present market requirements, has been the policy of the mangement in recent years. Mr. Graham, the general superintendent, besides being a practical operator with years of experience and intimate knowledge of the Island fields, was one of the first to take an interest in "Safety First" measures. As Chief Inspector of Mines he took a very active interest in this phase of underground work, and his concern for the safety of the men has been manifested in many ways since then. In recent years the Hon. Wm. Sloan, Minister of Mines, has introduced from time to time regulations under the "Coal Mines Regulation Act" for the protection of the lives of coal miners, and under Messrs. Savage and Graham this company always has promptly and unhesitatingly complied with the same.

Part of Surface Plant, Cassidy Colliery. Note slope in left foreground and manway in center foreground

Cassidy — an Ideal Colliery Village

The Granby Consolidated Mining & Smelting Company began the development of coal lands at Cassidy, a few miles south of Nanaimo, in 1917, chiefly with a view to supplying coal for their by-product coke ovens, then newly installed, at Anyox, one of the important copper smelting centres of British Columbia. No expense was spared in making Cassidy as ideal colliery community and in point of artistic finish, together with conveniences and entertainment facilities for the benefit of the men, it stands by itself in this Province. The streets are boulevarded, the houses surrounded by lawns and flower gardens, modern sewerage and waterworks systems are provided; there has been laid out one of the finest athletic parks in the country, with baseball diamond, football ground, tennis courts, bowling green and quarter-mile track; a natural grandstand is furnished by the hillside back of the field which the Company has reserved, together with the timber, as a natural park; and there is a recreation hall containing a variety of modern amusement equipment. The houses are varied as to architecture and the rooming house, containing about eighty rooms, is steam heated, electric lighted and each room has running hot and cold water. Furniture and bedding are supplied. The entrance to the mess house is through a pretty, vine-covered pergola, while the dining room, which is steam heated in winter, contains small tables each seating six men. The kitchen is equipped with electric dish washing machine, vegetable paring machine, tables heated by steam coils to keep dishes hot, and a large bake oven and refrigerator plant. There are also a first-class change house; a hospital and a First Aid Station equipped with Gibbs apparatus, smoke chamber etc., as well as a lecture room for first aid and other instruction; and well fitted carpenter, machine and blacksmith shops. The tipple is up-to-date, the track scale being a Fairbanks standard, steel-and-concrete, and the rock cars are handled with special Wilson rotary dump. The washery, as at first installed, has two 2-compartment jigs with a capacity of 40 tons an hour each, together with a sludge recovery using the same water repeatedly. The washed slack is used at the Anyox by-product ovens, the lump, nut and some pea coal being sold. Subsequently there were added seven Deister-Overstrom coal washing tables for washing the fine slack and a Dorr thickener 75 feet in diameter. At first the power plant consisted of two Badenhauser water tube boilers, 260 h.p. each, fired by mechanical stokers, the ashes being removed by washing and fluming to the dump. Later the power plant capacity was increased by a 360 h.p. B. & W. boiler. The compressor is a Rand cross-compound condensing, capacity 2,000 cubic feet of free air a minute, which is used for supplying the underground drills, pumps and hoists. Electric power is supplied by an Allis Chalmers 450 kw. generator and an auxiliary unit, 250 k.w. The rest is of Westinghouse make. A Worthington fire pump, capacity 1,000 gallons a minute, is provided for emergency. An electric locomotive and six

automatic side-dumping cars of the Granby type were added to the surface equipment in 1921.

Cassidy Underground Development

The mine is opened on the full dip of the seam, the main slope being driven 7′ x 14′ in the clear to allow for double track, a separate manway being provided as a travelling road. The pillar and stall system is used, the panels being relatively small as a precaution against fire, and large pillars are left along the main haulage ways and permanent airways. As far as possible gravity is used in delivering coal from the working faces to the main haulage system, and storage battery locomotives are utilized on the underground levels. Ventilation is supplied by a Sirocco fan with a capacity of 150,000 cubic feet of air a minute, which is driven by a 150 h.p. Westinghouse electric motor. The fan house is of concrete,as are also the housings for the telephone exchange and the motor generator set for charging storage battery locomotives. The mine cars are of wood, with a capacity of 1¾ tons.

A problem has been presented to the colliery management in recent months in the form of more or less frequent outbursts of gas, the first one occurring on January 14th, 1921. The coal displaced by this means has run as high as 150 to 400 tons. As a rule these displacements are not violent, simply moving the face forward from ten to fifteen feet. Sometimes the coal is powdered and, as there has been no violence, it is assumed that it is in a fine state of division in the pocket in which the gas has been contained.. An analysis of this dust showed an ash content of 40 per cent. As a result of this condition the British Columbia Department of Mines has made some special rules. The use of powder underground has been prohibited and boring in advance of the working faces is being insisted upon.

C. M. Campbell, the superintendent of the Colliery, has assembled an efficient staff about him. Under his management the industry has advanced in the course of a few years to one of the most important of Vancouver Island in point of production. In 1921 its output was 268,962 tons.

Nanoose-Wellington Mine

The Nanoose-Wellington Collieries Co. Ltd., with a production in 1921 of 50,206 tons, is situated at Nanoose Bay, about nine miles north of Nanaimo. The mine is worked on what is known as the Old Wellington seam, which is reached by a shaft 8′ x 16′ at a depth of 133 feet. The seam varies in thickness but the coal is of excellent quality. Generally speaking the pillar and stall system is used, although longwall has been adopted on occasion. The plant consists of three boilers with a total h.p. of 360, two compressors delivering 950 cubic feet or free air a minute, and a first motion hoisting engine of 75 h.p. Electrical power is generated by a 150 k.w. generator, and the power is extensively used in the screening and washing plant. Haulage has been shortened by a new level and the main level has been relaid with 30-lb. steel rails, and some sharp curves removed. The storage bunkers have a capacity of 1,000 tons, coal being conveyed thence to the shipping point on the water front by means of cars. A conveyor belt has been installed at the company's wharf, immensely improving loading facilities. Although housing conveniences have been provided at the mine, a "jitney" service permits men to travel between Nanaimo and their work. The Wheat electric head-lamp is used and has been giving general satisfaction. J. A. Coleman, resident at Seattle, Wn., is the managing director and James W. Jemson, the mine manager.

Other Collieries

Several other collieries warrant brief mention. The Pacific Coast Coal Mines, Ltd., superintendent George Wilkinson, has not been operating since 1921 owing to financial complications which have involved prolonged litigation. Its chief property is the Morden Mine, which is situated in the Cranberry District about two miles from South Wellington, and is worked on the Douglas seam. The mine is entered by two shafts sunk to a depth of 600 feet, and ventilation is produced by a Sheldom double entry fan 7 feet in diameter, driven by a 16″ x 17″ Vulcan Iron Works engine. Within the past two or three years there has been a complete overhauling of the boilers, steam lines, electric units and screening plant, the railway has been regraded in part, and the Boat Harbour plant, (the shipping point) has been given necessary attention. The Jeffrey-Robinson washer has been practically rebuilt. The underground and surface equipment is in good shape and the mine is ready for resumption of work when financial and legal difficulties are removed. In 1920 the output of this colliery was 94,904 tons.

Messrs. King & Foster, headquarters Nanaimo, are taking a few thousand of tons a year from the old Adit Mine, on the original Wellington seam, which formerly was operated by R. Dunsmuir & Sons. Their operations are being extended so that the output is expected to grow steadily.

The East Wellington Coal Mines, Limited, are opening a mine adjacent to the old "Jingle Pot" area a short distance west of Nanaimo. It is on the Wellington seam and the company, which has acquired 750 acres of coal land, will use the plant and wharves of the abandoned "Jingle Pot" Mine. The seam is 5½ feet thick and is expected to yield, within the area indicated, 6,000,000 tons. H. W. Maynard is president and J. J. Grant, general manager of the company.

Present-day Conditions

Coal mining on Vancouver Island is not now the simple matter it was twenty or thirty years ago when R. Dunsmuir & Sons were making their fortunes and the chief export market was San Francisco, a point from which scores of thousands of tons were distributed annually at a good profit. No longer can the coal be taken almost from the grass roots and shipped at relatively small cost for production and freight. The old workings are far advanced, the haulage distances are much greater, and the market demands in point of quality much more exacting. On top of this the seams are badly faulted in places and it requires technical knowledge of a high class, as well as intimate acquaintance with local conditions, to keep consistently in the coal. The handling of larger quantities in much more extended underground workings has necessitated far closer attention to safety measures. It is to the credit of the operators, as well as to the watchful inspectors of the Department of Mines, that the industry has been carried on without more accidents than have happened. True, there have been disasters, but the close investigation that always follows usually has proven that the cause was some thoughtless disregard of known regulations. These unfortunate

experiences from time to time have brought to light conditions open to improvement, and where that has been shown the necessary rules invariably have been formulated by the Government and as invariably have been cheerfully adopted by the companies. First Aid and Mine Rescue Work engage the attention of men in all the mining centres, encouraged in practical ways both by the Government and the colliery managers. There are Government stations at Nanaimo and at Cumberland. The Gibbs Apparatus is used at the former centre and the Paul at the latter, and in both places the keenest interest is taken in all First Aid competitions. The best of good feeling exists at present between all those engaged in the industry on the Island. The industry never has been in more satisfactory circumstances, and the Island field, given the market, is capable of a much greater annual production than the average during the past five years.

LETTERS FROM READERS

That Decimal Point!

To the Editor, Canadian Mining Journal,
Sir,

In your issue of July 20th, p. 544, in the article on Natural Gas and Petroleum Resources of Western Canada, the following statement is made. "In the United States the production of carbon black is an important industry with an annual production of about fifty million pounds in the manufacture of which some forty-one million cubic feet of natural gas are consumed." I should think there were "some." That is more than a pound of carbon black is recovered per cubic foot of gas.

The weight of a cubic foot of natural gas with specific gravity of 0.6 is .045. Assuming the gas is all methane or CH_4 there would be 12 of carbon and 4 of hydrogen, or 75 per cent carbon in the gas. Multiplying the weight of a cubic foot of gas, viz., .045 lbs. by .75 gives about .03 lbs. as the total carbon in a cubic foot. Not more than one-tenth of this would be recovered in the form of carbon black. I take it the decimal point should be shifted over several places, if not, the manufacturers of carbon black are wasting their time in doing something trivial, they should be working on the problem of Perpetual Motion.

Explain to us, Editor, what you mean by allowing such statements to be set before the young and innocent.

"Reader on the Ninth Concession"

* * *

(We refer our "reader on the Ninth Concession" to the Mines Branch Summary Report for 1921, page 59, where R. T. Elworthy says: "In 1921 fifty-eight million pounds [of carbon black], valued at over $5,000,000, were obtained from 49,000,000,000 cubic feet of gas in the United States. The process is very inefficient, as only about 1 to 1.2 lbs. of black is produced from 1,000 cubic feet of gas, compared with a theoretical yield of about 40 (2.5 per cent recovery.) Although investigations have been carried out with a view to increasing the efficiency, thus far it has only been obtained by a corresponding sacrifice of quality in the product. Here is an opportunity for the physical chemist." The statement in our issue of July 20th should have read "some forty-one *billion* cubic feet of gas. We have not yet reached the point of efficiency indicated by Mr. Elworthy as so desirable." — Editor.

PROGRESS ON COLONIAL

Inquiry has disclosed the fact that Continental Mines, in running a crosscut on the Colonial at Cobalt from the contact orebody at the 940-foot level, has struck another vein. The company is said to be shipping 20 tons of milling ore daily from development. The higher grade ore is being stored in one of the old Colonial stopes. It is understood, as soon as 3,000 tons of ore have accumulated in the stopes, shipments will be made at the rate of 100 tons daily. A contract has been entered into with a local concentrator to treat the milling rock. No details are forthcoming as to the new Colonial orebody, other than that it "carries native silver and good mill-grade."

The first vein encountered on the Colonial is yielding milling ore, but laterally the exceptional width of nine feet and over was not maintained. Development work has indicated that the best values lie above the contact and that the vein will probably extend upwards for a distance of about 300 feet. Both ore-bodies found thus far are above the contact, and more of them are expected. In its exploration programme the Colonial management is being guided by the experience gained at neighboring properties, where the enrichments are reported to have extended for approximately 300 feet in length.

At Kirkland Lake the machinery for No. 1 shaft of Continental Mines has arrived and is being delivered on the ground. The cement foundations have been poured, the pole line is up, and underground exploration by means of power drills is expected to be under way by August 15th. Active preparations have been begun to commence sinking No. 2 shaft, to the south of No. 1, from which extensive underground exploration will be conducted, as intimated some weeks ago.

PERSONAL AND GENERAL

Mr. A. D. Miles, who has charge of the Canadian exploration developments for John Taylor & Sons of London, England, has been visiting Porcupine and Kirkland Lake to inspect the work being done on some of the properties under option to his company.

Mr. R. M. Wolvin, president of the British Empire Steel Corporation, was in Sydney for several days last week, inspecting the steel works.

Sir Newton Moore made a tour last week of the steel plant at Sydney and the collieries round about.

Mr. W. D. B. Motter, who is known in Canada for his attempt to concentrate the lean iron ores of Hastings County in the plant of Trenton, Ontario, is now assistant to the vice-president of the Chile Exploration Co.

Mr. J. L. Retallack has returned from the west coast of Africa, where he was engaged in harbour construction, and will resume active mining development in the Kootenays.

Dr. Charles Camsell will accompany Hon. Charles Stewart to the Economic Conference in London, to represent Canada in matters related to the mineral industry.

NITRATE

The production of nitrate in Chile is now approaching normal, and the price for the next year, fixed in May last by the Nitrate Producers' Association, is slightly above that of last year. For the first four months of 1923, exports reached 760,000 metric tons, over three times the quantity during the same period last year.

Portland Canal Having Its Thrills

By ALEXANDER GRAY

It is of more consequence to Canadians that Dr. J. M. Maclaren and H. S. Denny, C. B. E., both of London, are in the Portland Canal mining area of British Columbia, upon professional business, than it is to have the cables convey the disconcerting information that the shares of the Selukwe Company, controlling British Columbia Silvers Corporation, have declined to 10 shillings. Selukwe holds (or held) 902,000 British Columbia Silvers shares. It got them cheap, when they were of problematical value. Other shares in companies with properties near-by in the Portland Canal district were acquired by Selukwe. The success attained by the Premier Gold Mining Company bestirred the locality—and properly so. Under the direction of Engineer Banks, a crosscut into British Columbia Silvers territory intersected what is taken to be a portion of the Premier ore-bearing zone. The values corresponded with those of the Premier. Mr. Banks did not magnify nor minimize them. London broke loose, shook off the bridle, went on the rampage. Selukwe shares, because of its British Columbia share holdings, went to 50 shillings. That they are back almost to where they started from is indicative of what London can do, when conservatism and discretion are set aside.

At one time Selukwe's issued shares were valued in the market approximately at £2,000,000. The Premier Gold Mining Company, privately owned and rarely dealt in, is nominally capitalized at $5,000,000. Odd lots of Premier shares have been traded in at $3 to $4; but that was when the properties were providing profits and it was known they were of undoubted merit.

The contrast between Selukwe and the Premier became acute when the former soared and slumped — with no explanation from the directorate. If Selukwe Directors did not take advantage of their market and provide the company with abundant working capital —if those who bought them on the advance did not take their paper profits — then Canada cannot be charged with responsibility for those steep climbs and nose dives — which may or may not confuse the real issues as to London interests in Portland Canal.

The issues at Portland Canal must not be confused. If there has been a disappointment at the British Columbia Silvers ground, London is at fault. London jumped to the conclusion that the Premier performance was about to be duplicated. The episode does not necessarily mean that British Columbia Silvers are tarnished. It simply means that the World Metropolis was more violent than it should have been. Only speculators shrieked when Selukwe fell.

The Selukwe market was a London creation. British Columbia Silvers' shares were purchased at a low starting price. The difference between the Selukwe and Premier operations is that the latter were an outstanding success before any shares were made accessible to the general public. London billiardists applied the "English" and "reverse English". It remains for Dr. Maclaren judicially to umpire the game. Contrary to the newspaper stories, his special mission was not for the purpose of examining the Indian Mines properties. He has been privileged to inspect the Indian premises; but Montreal and Toronto owners have learned that Dr. Maclaren has to do with the British Columbia Silvers situation.

Several London groups have sought a participation in the Indian. Already there is a London interest in the company. Yet there is no intention to dispose of Indian control — at least until the development programme is further along. Within a few weeks, additional financing has enabled the Indian Company to adopt a more expansive policy. That has priority at the moment. What Dr. Maclaren has to say of the Selukwe areas and the district in general will be none the less interesting as he is the technical adviser of an influential combination of mining capitalists.

Mr. Denny, it is stated by the daily press, is accompanied by Mr. R. B. Lamb, the "eminent mining engineer". That being so, including Dr. Maclaren, London will have authoritative information from a triumvirate whose experiences extend over Australasia, Mexico, Africa, India and Mexico, South America and West Africa as well, Northern Ontario, and now British Columbia. Dr. Maclaren was one of the first to recognize the significance of the geological features of Porcupine and to indulge in projections, the accuracy of which has been sustained by deep development. Certain of his principals in the present instance participated in the Rochester Veteran Claim promotion. Mr. Denny's South African principals are active at Kirkland Lake and have a substantial portion of the Moneta issue. He is now dealing with the Forty-Nine, Daly Alaska, and other Portland Canal properties — unless London's ardor has been chilled by the Selukwe.

As to the Indian Mines, more plant is to be provided by the Canadian owners. If London wishes to join with the Canadians who have brought the Indian so far along, they can do so. The intention is to carry the Indian upper workings throughout the Portland Claims, and to exploit the outcropping ore-bodies on the Indian Morn. Inquiries emanating from London sources leave no reason to doubt their readiness to consider the Indian; but Montreal and Toronto are said to be keener about hanging on than about letting go what may be a very much larger enterprise. They realize, however, that time and working capital are essential factors.

INDUSTRIAL ITEMS

The Canadian Rock Drill Company have opened an office at 170 McGill Street, Montreal, where they carry supplies to fill the requirements of those in Quebec and the Maritime Provinces who use their products.

Powley and Moody Limited, Canadian distributers for the Automatic Transportation Co., Buffalo, N. Y., report that they have just delivered a Type "AA" 2 ton electric locomotive for underground service at the Lythmore, Ontario, property of the Ontario Gypsum Company Limited. They also report that the market is becoming persistently active in connection with storage battery electric trucks, tractors, and engines, and kindred equipment. They have moved their Toronto office recently from 105 Bond St. to 85 Florence Street, at the Brock Avenue subway.

The current number of *Asbestos* asks, "Is it by virtue of the insulating properties of dead air cells that college chaps can go bareheaded summer and winter?"

The Quebec Asbestos Industry

III — The Recovery of Fibre at Present Lost in the Milling of Asbestos

By G. ERNEST BOOKER

As mentioned in a previous article, there are ways of recovering the asbestos fibre that at present is passing out of the mills along with the dust created in the process of milling. This fibre loss is considerable, and in some mills will run as high as 14 tons in twenty-four hours. It will be as well, however, to consider the actual conditions prevailing in the present mills before going into the pros. and cons. of each method of recovery.

Assume, then, for example, a mill that at present is losing 10 tons of fibre per day. This mill will also be emitting probably 12 tons of dust in the same period. The fibre and dust are carried out of the mill and scattered over the surrounding countryside by a large volume of air, which may be anything from 25,000 to 250,000 cubic feet per minute, at the mill. This dust-laden air of course becomes mixed with the outside air as it leaves the mill building, and the dilution renders the settlement by gravity of the solid matter more difficult; thus with the aid of the outside air-currents, the mixed dust and fibre is carried and distributed over a considerable area before even a partial settlement takes place.

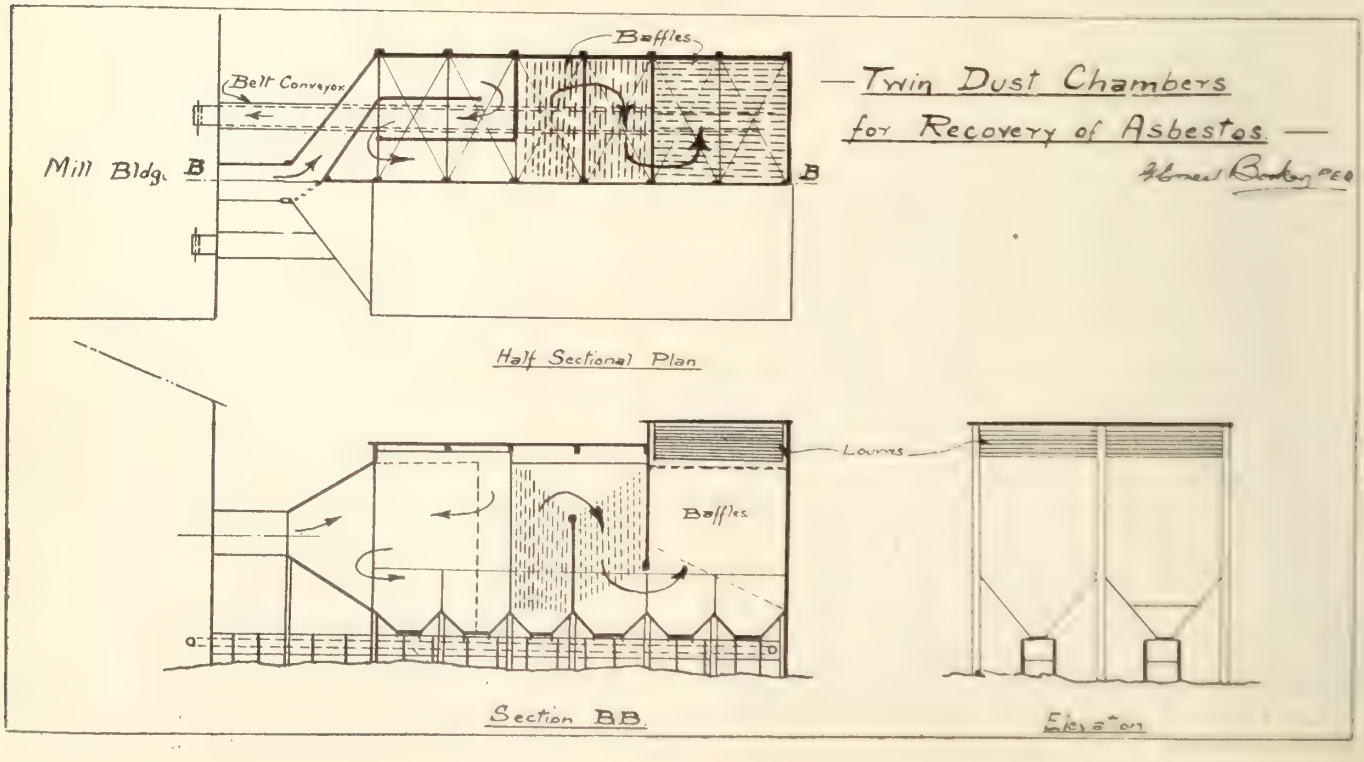
An air current with a velocity of 2,000 feet per minute will pick up and carry with it all light fibre and dust; but even with a velocity of 400 feet per minute very little separation and settlement will take place.

Now the atmospheric conditions prevailing in the locality of any mill are continually changing, most of the changes having a distinct bearing on the quantity of solid matter the air will carry in suspension. These changes are due to temperature and moisture, both of which are beyond human control in the great out-doors.

The effects a change in temperature has upon a mass of air are two in number. Raise the temperature, and expansion takes place, which reduces the denseness of the mass. The increased volume will correspondingly increase the velocity of the mass through ducts, etc. Thus a rise in temperature will tend to cause a settlement or separation of solid matter due to the reduced density of the air; but the increased velocity due to the same cause will nullify the effect.

The moisture or water in suspension in the air is also a factor that bears upon the separation of solid matter from the air. The variations of temperature also affect the power of the air to carry moisture in it; for instance at a temperature of 32° F. the moisture content may be anything up to three-tenths of a pound only, at atmospheric pressure, but at a temperature of 90° F. this may be seven times that amount, or 2.1 pounds per thousand cubic feet. Now the effect of moisture in the air is to make it dense, and the greater its density, the more buoyant it is for solid matter suspended in it. From all of this it would appear that under certain conditions the air is capable of carrying a considerable amount of solid matter in suspension for considerable periods. In other words, its behavior is very much like that of a colloid, if not actually colloidal in the strict sense. It is therefore apparent that the atmospheric conditions do materially affect the gravitation of solid matter suspended in the air, and must enter largely into one's consideration when deciding upon a type of recovery plant.

Let us proceed with the example mentioned above, namely the recovery of the 10 tons of fibre which is known to be carried away from the mill daily, this fibre being suspended in a large volume of air, say 50,000 cubic feet per minute. Reducing these figures to a convenient form one has: solid matter per day — fibre 10 tons; dust 12 tons; total 22 tons, or 30.5 lbs per minute. The air per minute is 50,000 cubic feet. Then the solid matter suspended in a thousand cubic



— Twin Dust Chambers for Recovery of Asbestos. —

feet of air is equal to 0.61 pounds, or, volumetrically, 7.2 cubic inches solid matter in one thousand cubic feet of air.

This sounds like the proverbial "needle in the haystack"; but the greater portion, if not all, of that solid matter must be recovered, because the fibre content is worth almost two million dollars a year to the owners. It can be done, and so, as a beginning, all the dust and fibre-laden air in the mill is collected and brought by means of a duct to the point where the recovery plant is to be established. It is, therefore, from this point that the various ways of recovery will be described and compared with one another from different angles. The methods by which fibre can be recovered have been mentioned previously and they will be considered in the order named.

(1) Settlement by Gravity in a Dust Chamber

Fig. 1 illustrates a type of dust chamber which is probably the most suitable for the recovery of asbestos fibre. The air, fibre and dust are brought to the structure by means of a duct having a cross sectional area of 20 square feet. This, handling a volume of 50,000 cubic feet a minute, will mean that the velocity of the air at the entrance is 2,500 feet per minute. As no settlement or separation will take place at this velocity, it must be reduced by stages to a predetermined minimum. To accomplish this reduction in velocity, the passages or ducts in the chamber are of increasing area throughout, and in the last stages in the chamber a series of baffles are arranged to exert a frictional drag on the air, thereby extracting much of the solid matter still held in suspension. It is, of course, understood that the placing of baffles in a current of air will not materially reduce the velocity alone; in fact, baffles improperly arranged will give the opposite effect, and instead of separation and settlement taking place, the fibre and dust is picked up in places and carried through the apparatus completely.

The construction of dust chambers is a comparatively simple one for the asbestos industry, since no heat or gases exist which would necessitate special precautions; but attention must be given and care taken to see that all walls and partitions are solid and that there are no leaks anywhere. The reason for this is easily seen when one considers that on the two sides of any partition the velocities are different, and so a leakage would disturb the separation and settlement through a considerable area. The chamber illustrated, it will be noticed, is of the twin type, enabling one side to be cleaned out while the other is in operation. Hopper bottoms are provided, which discharge to belt conveyors to convey the fibre and dust recovered to the mill.

The chamber shown is constructed of concrete and gunite and is probably the cheapest form of permanent structure, the estimated cost being from $4,000.00 to $5,000.00, which is insignificant compared with the value of the fibre that such a plant will recover. Assuming a recovery of only 50 per cent, the fibre recovered per annum amounts to 1,500 tons, which at last year's prices means a revenue of approximately $32,000.00.

The actual cost of recovery is not obvious at once, because one is apt to get the idea that, as the separation is secured automatically by gravity, the operating costs are only the interest charges on the plant. This is not so, for before the recovered fibre is marketable it has to be graded and cleaned as well as packed, the cost of which operations must be considered. However, the possibilities of the dust chamber are worth serious consideration, and it may yet be the means of saving some of the asbestos mills from failure.

(To be continued)

ASBESTOS IN THE UNITED STATES

In 1922 the domestic asbestos industry of the United States came to a standstill, according to a statement from the Geological Survey. Only 67 short tons of all varieties of asbestos, valued at $10,120 was produced in 1922, as compared with 831 tons, valued at $336,968, in 1921, and 1,648 tons, valued at $678,231, in 1920.

The Arizona field is the most promising in the United States. The industry there was developed rapidly from a small initial production in 1914 to its maximum in 1920, when it supplied asbestos worth 96 per cent of the total value of the domestic asbestos marketed. This great increase was due to a steady rise in the price of "crudes", which reached a maximum late in 1920 and early in 1921. In 1921 the general business depression greatly decreased the demand for asbestos and prices fell continuously throughout the year. In 1922 the plight of the Arizona miners was made worse by a further decrease in prices, due in part to keen competition with chrysotile from Rhodesia. The prices of "crudes" during the last five months have been remarkably constant, No. 1 Canadian being quoted at $500 and No. 2 at an average of about $290. Each of these prices is about 80 per cent higher than the pre-war figures.

Information received from several sources indicates that there will probably be increased activity in mining asbestos in Arizona in the second half of 1923. Many deposits have been located within the San Carlos and Fort Apache Indian reservations, which were thrown open for entry only in 1921. Some of these deposits are under lease from the Bureau of Indian Affairs and have been partly developed. Outside the reservations there are several deposits, which have been extensively developed but on which operations were suspended in 1922.

One of the chief difficulties in marketing Arizona asbestos has been the work of bringing the producer and the consumer together. To assist in this work the Geological Survey made a canvass of the stocks of Arizona asbestos on hand and for sale on May 22. The returns show that on that date there was ready for shipment 312 tons of "crudes," distributed as follows: No. 1 (including some 1 A), 77½ tons; No. 2, 194½ tons; No. 3 (including some No. 4), 40 tons. Some of these stocks were in lots as large as 130 tons and one included as much as 90 tons of one grade.

ALBERTA REPORT

The "Annual Report of the Mines Branch of the Province of Alberta, 1922", is a comprehensive volume of 336 pages, dealing exclusively with the coal mines and their product. In it the Chief Inspector of Mines, Mr. John T. Stirling, gives, in tabular form, the year's records of the mines and mine accidents, a list of certificate holders, a list of the mines, and a short description of the personnel and equipment of active mines. There is also included the report of the Fuel Engineer, Mr. George R. Pratt, whose activities have contributed largely to the present extended market for Alberta coal and the attempt now being made to sell it in Ontario.

GOLD AND SILVER INQUIRY

The United States Senate Commission of Gold and Silver Inquiry has issued an invitation to all silver producers on the American continents to send representatives to a conference to be held in Reno, Nevada, on September 4th 1923. At this conference questions will be discussed relative to the decrease in the production of silver and gold in the United States and elsewhere, the problems involved in marketing gold and silver, and the effect of the decrease in production upon commerce, industry, exchange and commodity prices. The conference is designed to aid the Commission in preparing a report to Congress, due on January 1st, 1924.

REVISED STATISTICS ON THE MINERAL PRODUCTION OF CANADA, 1922

The Dominion Bureau of Statistics issued on July 23rd the following finally revised statistics on the production of copper, nickel and metals of the platinum group in Canada during 1922.

Copper

The production of copper in Canada during 1922 amounted to 42,879,818 pounds which at the average New York price for the year (19.382 cents per pound) was worth $5,738,177 as against 47,620,820 pounds valued at $5,953,555 or an average price of 12.502 cents per pound in 1921. The decrease amounted to about 10 per cent in quantity and 3.6 per cent in value, and the year's output was the lowest recorded since 1904.

The production included: (a) 29,595,440 pounds contained in blister copper produced during the year, part of which was refined in Canada and part exported to the United States for treatment; (b) 10,841,647 pounds contained in nickel-copper matte produced at Sudbury during the year some of which was exported and some refined in Canada; (c) 57,708 pounds contained in copper sulphate; and (d) 2,385,023 pounds, the estimated recoveries from ores, concentrates and residues exported for treatment.

The corresponding figures for 1921 were (a) blister copper, 32,122,678 pounds, (b) copper in matte, 12,645,391 pounds, (c) copper in copper sulphate, 162,111 pounds, and (d) copper contents of exported ores and concentrates, 2,690,640 pounds.

COPPER PRODUCTION BY PROVINCES

	Quantity Pounds	Computed Value
Ontario	10,943,636(a)	$1,464,477
British Columbia	31,936,182	4,273,700
Total for Canada	42,879,818	5,738,177

(a) Includes some copper derived from speiss and residues from the silver smelters and gold mines of Ontario.

The total production of refined copper during 1922 was 730,000 pounds as compared with 4,286,000 pounds in 1921. During 1922, the plants of the British America Nickel Corporation were idle and the total Canadian production was from the refinery at Trail.

Nickel

Owing to the stagnant condition of the nickel market, the production of this metal in 1922 was lower than in any year since 1904, and compared with 1918, the banner year to date, the production of 1922 showed a decrease to only 19 per cent of the quantity and 16.7 per cent of the value. The output included 17,355,056 pounds contained in nickel-copper matte made by the Canadian smelters treating Sudbury ores and 242,067 pounds, the nickel contents of smelter products resulting from the treatment of silver-cobalt ores.

During the year, 259,569 tons of nickel-bearing ore was mined in the Sudbury district. The smelters treated 314,120 tons from which 17,324 tons of matte was produced. The refinery of the International Nickel Company at Port Colborne was the only nickel refinery operating in 1922. This plant treated 10,340 tons of matte from which 11,065,473 lbs. of metallic nickel and 2,389,840 lbs. of nickel oxide having a reported sales value of $3,140,399 and $389,398 respectively were produced.

PRODUCTION OF NICKEL IN CANADA, 1922

		Quantity pounds
Produced from Sudbury ores		17,355,056
Produced from cobalt-silver ores		242,067
Total production	Quantity	17,597,123
	Computed Value*	$ 6,178,993

* The production was valued at 35 cents per lb., the average New York quotation for nickel in 1922.

Metals of the Platinum Group

The production of metals of the platinum group in Canada for 1922 was derived almost entirely from the nickel-copper ores of the Sudbury district. In accordance with the low production of nickel-copper, the amounts of metals of the platinum group recovered were comparatively small. The actual production figures have been augmented by the addition of quantities produced prior to 1922 but reported for the first time in that year.

The production was valued at the average New York quotations for the year which were as follows: platinum $97.618 per fine ounce, palladium $65.00 per fine ounce and osmium group $80.00 per fine ounce.

METALS OF THE PLATINUM GROUP, CANADA, 1922

	Platinum	Palladium	Rhodium, Osmium, Ruthenium & Iridium
Produced by Canadian and United States nickel refineries from Canadian ores .. fine ozs.	458	724	391
Value	$44,709	$47,060	$331,280
B. C. Placers .. .. fine ozs.	11	...	1
Value	$ 1,074	...	80
Total for Canada .. fine ozs.	469(a)	724(b)	392(c)
Value	$45,783	$47,060	$331,360

(a) includes 282 ounces palladium
(b) includes 388 ounces palladium
(c) includes 266 ounces of others

Platinum not reported previous to 1922.

RAPID HOISTING ON RAND

A new electric hoist at the Randfontein Central Gold Mines raises a load of 10,000 pounds from a depth of 5,000 feet at a speed of 4,000 feet per minute. Fifteen seconds are allowed for acceleration, ten for retardation, and five for loading and tripping. The speed is controlled automatically as to acceleration, maximum and retardation. Dynamic brakes are used, which turn the energy let loose by retardation into useful electric energy.

CHECK-OFF REQUIRED

Employees being signed on again by the Dominion Coal Company are required to sign the U. M. W. A. check-off anew. It is evident that those who intend to break away from the U. M. W. A. will not be employed by the Company.

At the Wheal Busy mine in Cornwall, formerly worked for tin, a new shaft is being put down to develop a vein of arsenical ore, determined already as 4 to 8 ft. wide and 300 ft. long, with an average of 15 to 20 per cent. arsenic.

THE MINING DISTRICTS

By THE JOURNAL'S CORRESPONDENTS

NORTHERN ONTARIO

South Lorrain. — McKinley-Darragh has taken an option on the Paul claims in South Lorrain, on which a discovery was made recently. The vein is reported to be about 18 inches wide and to carry fair values in silver. The company has let a contract for the sinking of a 50-foot shaft. Development in South Lorrain continues promising, and both the Keeley and Mining Corporation are obtaining a substantial production. Sinking operations will shortly be started on the Lorrain Consolidated, as well as on the Maidens property, which is under option to interests associated with the Keeley, while the ground under the bed of Trout Lake will also be explored.

Cobalt. — Milling has been started on the Beaver, which is being operated by the Coniagas. The mill has been very largely rebuilt and now has a capacity of 150 tons a day. A substantial tonnage of ore is broken on the stulls underground, and several discoveries have been made within the past few months that give promise of a supply of ore for some time to come. The lower levels of the Beaver are being unwatered through the Temiskaming shaft, and when this has been completed, exploration will be started on the lower contact of the diabase sill. Some years ago a large vein, carrying encouraging amounts of silver, was encountered at 1,200 feet, and it is on this vein that work will be concentrated.

The Colonial Mine is preparing to resume shipments of mill rock to the Mining Corporation plant. A new vein was found recently to the north of the shaft at the 935-foot level, and carries some silver.

A new level has been opened at a depth of 685 feet in the new Violet shaft of La Rose, and the vein should be encountered within a few days. On the 635-foot level drifting operations disclosed a body of high-grade mill ore, in addition to a fair amount of high-grade. The Company is shipping regularly to the Mining Corporation's mill.

Porcupine. — Both units of the Lower Sturgeon hydro-electric plant are now in operation, and for the first time in many months there is a surplus of power in Porcupine. The Northern Canada Power Company has about 3,500 h.p. available which is not being used, but this will be absorbed by the Hollinger as its milling capacity is increased, and other companies will no doubt take more. A very considerable rainfall during the past month has resulted in the storage basins on the Metagami River being filled up and it is expected that no further power troubles will be experienced for the balance of this year. The power company believes that it will be able to provide sufficient power until the Quinze development is completed in 1924; but it is probable there will be another shortage next winter. Although the case between the Hollinger and the Northern Canada Power Company has not yet been settled, the Hollinger is going ahead with the development of its power on the Abitibi River and has let contracts calling for the development of 20,000 h.p., the estimated cost of which is approximately $3,000,000. The Great Northern Power Company is delivering power to the Davidson and in a short time will also be supplying the Newray and Night Hawk Peninsular mines.

The Dome is running a crosscut on the 12th level to intercept the ore-body recently encountered by a diamond drill. It was reported that the drill had cut 50 feet of $12.00 ore lying to the south of the intrusive porphyry mass, which it was feared might cut the hanging wall ore-bodies off below the 12th level. The company is treating over 1000 tons a day, and is producing at the rate of approximately $400,000 a month. It is stated that as soon as the new stock certificates are printed, the present stock will be split and shareholders will receive two shares of the new stock for one share of the old.

At the Vipond the new vein being developed on the 300, 400 and 500-foot levels, has been found on the surface. This ore-body is of considerably higher grade than the general average of the mine, and will enable the management to maintain a milling grade of at least $10.00 per ton. It is expected that the alterations to the mill will be completed by the first of December, when treatment at the rate of 150 tons a day will be commenced. A Diesel oil engine will be installed in the mill to insure continuous operations.

At a shareholders' meeting of the Davidson Mines, held in Toronto recently, the directors announced that they proposed to begin work immediately on the sinking of a 1000-foot, three-compartment incline shaft. It was also stated that as soon as possible, work will be commenced on the construction of a 500-ton mill. Diamond drilling is stated to have had very satisfactory results. The company has approximately $550,000 in cash on hand, although this is in the nature of an advance and constitutes an obligation on the part of the Porcupine Davidson Company.

Larder. The Crown Reserve is understood to have disposed of 150,000 shares of treasury stock at 60 cents a share, which will be ample to finance the operations of the company for some time to come. The directors have decided to do 1,000 feet of drifting on each vein at the 350 and 550-foot levels. On the Associated Goldfields property, adjoining, a total of 3,400 feet of drifting has been done on four levels, most of which is in ore. The vein has a maximum width of 35 feet, and the grade is understood to be about $8.00.

Kirkland. In Kirkland Lake, operations are proceeding on a number of non-producing properties. At the Harvey-Kirkland, cross-cutting is being carried on at the 200-foot level, which is expected to cut several veins. As soon as the new mining equipment has been installed, the shaft will be continued to 400 feet.

Negotiations have been concluded for taking over the Townsite property by John Taylor & Sons, of London. One or two diamond drill holes will be put

down to determine the geological features, and a shaft will then be sunk to a depth of several hundred feet.

Operations have been commenced on the United Kirkland, the control of which recently changed hands.

The veins recently found in the 350 and 450-foot levels of the Montreal-Ontario are being developed rapidly. No information has been given out regarding the values found, but they appear to be sufficient to enable the company to sell a considerable amount of stock.

Underground operations at the Bidgood have been stopped on account of a lack of financial resources. It is rumored that the Tonopah Mining Company is negotiating for an option on the property.

Rouyn. — A Montreal company is trying to sell shares in the Rouyn Gold Mines by means of ridiculous statements and advertisements. While this district in Northwestern Quebec is one of considerable promise, there is nothing to justify the extravagant claims being made. The most important discovery in the district is on the Powell property, which is under option to the Noranda Mines. The main vein has been traced for a considerable distance, and two shoots of commercial ore have been found on the surface. The company has started a diamond drill to work in an effort to link up these two ore-shoots, and if this is successful, sinking will be commenced. Surface work on the Noranda has shown that the most valuable discoveries are toward the south end of the property On the Hammil group, lying to the north of the Noranda, a considerable amount of diamond drilling has been done, and it is understood that the results were not particularly favorable. Very little news is coming from Rouyn at the present time, and there is a tendency on the part of the prospectors to keep the news of any discoveries quiet. Claims in Quebec are up to 200 acres each in size, and the staking was very poorly done, so that boundary lines are often a matter of conjecture. Prospectors are disinclined to report discoveries, when it may be found afterwards they are upon an adjoining claim. This condition of affairs will continue until a good deal of surveying has been done. The bush in the vicinity is very dry, and it is feared that fires may break out again. The water in the Kinojevis river also is very low and a great deal of difficulty is now being experienced in getting into the district.

NOVA SCOTIA

A Vexed Question Now Settled — *The Canadian Mining Journal* for months past has been pointing to the only satisfactory culmination of the long drawn-out labor agitation carried on by labor leaders who seemed bent on the destruction of the coal and steel industry of Nova Scotia. It was clear to the *Journal* that all the miners of Nova Scotia could not follow their leaders through with the mad policy they had marked out for themselves and for the members of the organization. It was apparent that some day something more silly than usual would be done, and the end would be in sight immediately. No more senseless or futile strike was ever attempted than that brought on in the Cape Breton and Pictou collieries last month, and few have had such a sudden ending. President Lewis, in one fell blow, dealt with the offending officers and swept them out of the way. Their places were filled with provisional officers, and fourteen experienced organizers were brought in from the colliery districts of the United States to re-organize District No. 26. This last step was not necessary, for it took the Nova Scotia miners only a few days to realize the true state of affairs and to fall into line. The change of sentiment seemed rapid, but in reality there had been no previous desire on the part of the majority of the workmen of Nova Scotia to stop work, which they did only against their own better judgment

Leaders have Corrupted Morals of Miners — Of the labor officers who brought the men to such a stage, we have little just now to say. They are better left to the tender mercies of their own thoughts of what they now are and what they might have been. But something ought to be said to the average workman for the part he played in the affair, which was, to say the least, a most dishonorable one. I have heard it said a thousand times that among the workmen of Nova Scotia there are many fine men. That may be so, but men are not fine if they are not honest and if they allow other men to cause them to violate their word of honor. There was a time in the history of trade unionism when the officers and members of a Nova Scotia labor organization, the Provincial Workmen's Association, fought long and bravely to maintain inviolate the agreement they had made with the Dominion Coal Company, and in this they were ably backed up by the public, and won out. It is remarkable, however, that the very labor organization that assailed them at that time and had placed the now deposed leaders in the forefront has had to turn round and undo all their past labors. The United Mines Workers then taught the late leaders that it was a righteous thing to break an agreement, and spent over a million dollars vainly to prove it. In that great and fruitless effort they struck a blow at the conscience and at the common honesty of the mine workers of Nova Scotia. They are, therefore, equally responsible with the late district labor officers and with some of the rank and file for this moral degeneration.

The Silent Majority are Culpable — That the International Union later on recognized their mistake, and made an honest effort to remedy it, is well known. But there still remained in the minds of the workmen the experience of the past, when "scraps of paper" were torn up with delight with the intention of harassing the Dominion Coal Company. That the sense of honor had not completely died out of the breasts of the miners of Nova Scotia was made evident quite recently by the smallness of recent vote to strike in face of the agreement. Out of 13,000 men only a little over 3,000 voted in favor of breaking the agreement and going out on strike; the other 10,000 being either opposed or unwilling to violate their conscience remained away from the polls. The 2,500 voters who openly opposed the strike formed a nucleus of active men to whom it was afterward found possible to add the silent and, for the time being, passive majority. But it would have been infinitely better and more to their credit had all these men voted against a strike during the term of the agreement, and then turned to their leaders and dealt with them summarily for proposing any violation. It can truly be said of the many

who stayed quietly at home that they were ready to wait and watch the outcome of the struggle and to take what benefit was coming from the strike and then shout the praises of their leaders, who at the expense of the honor and integrity of the members of District No. 26 had again triumphed. Such are not the men who build up a strong organization of any kind. What is needed most today is common honesty. Men who in private life pride themselves in keeping their promises should not be less loyal to their word given in concert. The man who fails to respect his word of honor shows disrespect to himself and repudiates the principles on which the foundations of civilized society rest. Faith is a small word, and smacks of theology; but there must be more of it in the business relations of all engaged in the steel and coal industries of Nova Scotia, if these are to be operated on a successful basis.

There will be no longer any doubt in the minds of the miners as to what the Coal Company can do when a strike takes place in the summer time. This season was selected as the best time for the miners to win. But they have learned that power plants can be kept running, fans and pumps operating, and many other things kept going without their aid. They have also learned that, with proper protection, coal can be loaded at the coal piles and shipped from the piers at Sydney. It would have been better for the workmen had they learned this long ago, for they might then have escaped a strike that has been disastrous to their present hopes, though it doubtless has been a blessing in disguise.

BRITISH COLUMBIA

Alaskan Coal Production. — E. L. Bedell, president of the Alaska Bituminous Coal Co., announces that 14,000 acres of coal-bearing land situated on Moose Creek, Alaska, are to be exploited by a group of business men of Anchorage, Alaska; that outside shipments are being deferred until next April because of the necessity of supplying substantial quantities to the Alaskan railroad in the next three months; that a spur from the Matanuska branch of the railroad to the coal properties will be completed by the month of September; and that, as the coal is of high quality, averaging better than 12,000 British thermal units with about twelve per cent. ash, it is confidently expected that a large market can be built up with the cities of Portland and San Francisco on the Pacific Coast. The Company plans to purchase two ships of not less than 500 tons, one of which will be used for supplying the coal requirements of Alaskan coast centres and the other to carry coal to Oregon and California. Twenty thousand tons is said to be blocked out and no difficulty is likely to be experienced in reaching a daily production of 1,000 tons.

John L. Lewis Advises Miners. — John L. Lewis, president of the international body of the United Mine Workers of America, has instructed Wm. A. Sherman, president of District 18, U. M. W. of A. (Eastern B.C. and Alberta) that it would be well to withdraw the call issued for a general labor conference in Western Canada to decide upon a policy for sympathetic action in support of the striking miners in the Province of Nova Scotia. Mr. Lewis stated that the miners of District 18 must carry out the rules and policy of the U. M. W. of A. and fulfill their obligations to the Operators under the agreement in force. At the time of writing Mr. Sherman had not withdrawn the call but had promised a statement at a later date.

Dr. Camsell Summarises Coal Situation. — With reference to Canada's fuel supply, Dr. Charles Camsell, deputy Minister of Mines for the Dominion and Chairman of the Dominion Fuel Board that went thoroughly into the problem in recent months, recently said that there was nothing to add to the Committee's report. Generally it had been found that the coal fields of eastern Canada could take care of the requirements of the maritime provinces, of Quebec, and a small part of northern Ontario; that the prairies, from a point near the western limits of the great lakes, and British Columbia were independent, having supplies within their boundaries that were adequate; but that there was a gap between the east and the west, comprising the greater part of Ontario that, under present conditions, must be dependent upon coal imported from the United States. The investigation had served a good purpose. It had made clear the situation as to the fuel resources and fuel requirements throughout the Dominion and, with a thorough grasp of the problem, it should be easier to regulate distribution in the future in the best interests of all consumers should regulation be necessary.

GOOD MEDICINE

The following pen picture of Granby Bay and other parts of Alice Arm on the northern British Columbia coast, is from the *Granby News*, the little weekly that helps to make Anyox a model mining town:

To appreciate thoroughly the environs of Anyox, a motor boat is an essential. We have no land ways along which our feet may wander, our outings being confined to stretches of water hard to duplicate anywhere. On these we may roam where our fancy wills if the craft is a stout one and the "kicker" dependable. It is not everyone, however, who is fortunate enough to possess a hull seaworthy enough to bundle the family aboard on a Saturday afternoon and get far enough away from home to appreciate fully some of the wonders of this great north country. To the owner of the motor boat, any little cove is a haven and the forests stretching down to tide-water places of enchantment. For those who are not regular contributors to the coffers of the oil kings, they have an opportunity of indirectly contributing on occasion, while doing themselves and their families much good. Now this little article is not in the nature of an advertisement, it is purely gratuitous and well worth the price at that. Not having a boat of your own and lacking a friend who might possess such a thing, it will more than repay you in dividends of red corpuscles for such a thing, for the small outlay exacted for your transportation any Sunday morning to Alice Arm, where you may revel with nature at its best in the valleys of the Illiance or the Kitsault. If the writer were a Doctor, he would prescribe this trip occasionally for everyone and frequently for some. The salt air of the water trip and the pine-scented air of the big woods, through which many trails wind is good medicine, and yours for the taking. A walk along the Dolly Varden road bed to the second falls is recommended. Boil the "Billy" there, and it will surprise you especially if the wife and kiddies are along, how little there will be left of that luncheon, which looked

so big when you left home; and when you return to the quaint little town nestling on the flats of the Kitsault, drop into the wee place of the shoemaker, and very likely with your icre cream there will be a generous quantity of luscious strawberries freshly gathered from the garden behind; and before you leave, if you hint at coming from Anyox and remark on the beauty of the blooms outside the window by which you are seated, maybe you will be presented with a bouquet of bachelor's buttons, Canterbury bells, candy tuft, yellow faced susans and petunias. Suggestive of old gardens, are they not; and sounds old fashioned. And all in a mining camp, too.

ALASKA GOLD MINING IN 1922

According to a statement given out by the Department of the Interior, Alaska has produced in all $335,526,460 worth of gold and $8,833,922 worth of silver. Of this gold, $230,506,992 has been taken from placer mines, $103,227,434 from lode mines and $1,792,034 from copper mines.

In 1922 $4,395,000 was recovered from Alaska placer mines and $3,015,669 from lode mines. In the summer 507 placer mines, employing 2,150 men, were operated, and of these, 120 mines, employing 402 men, had also been operated the previous winter. The total number of large and small auriferous lode mines operated in 1922 was 28.

These figures are taken from the annual report of Alfred H. Brooks, of the Geological Survey, now in preparation. In this report he states that there is geologic evidence of the occurrence of extensive auriferous lode deposits in Alaska and that a rough estimate, based on the best data available, indicates that the Territory still contains some $350,000,000 worth of placer gold.

A NEW USE FOR KIESELGUHR

There occurs in the former lake of Jallaso in Sweden, now drained, a large deposit of kieselguhr containing a natural admixture of 20 percent of bituminous matter. It has been found that this raw material can be pressed directly into plates or blocks eminently suited for building purposes. By a single means these plates or blocks are made impervious to water, and this quality, in addition to their insulating quality, makes them extremely valuable for structural purposes. A new firm, the Swedish Kieselguhr Company, has undertaken the manufacture of this material in a plant with an initial annual capacity of 100,000 square metres of insulating plates. It is expected these plates will be used principally as an interior covering in stone and brick buildings.

OIL FROM TAR SANDS

It is reported that the Athabasca Petroleum Products will build a 250-barrel oil refinery at Fort McMurray this summer, for the extraction of petroleum products from the Athabasca tar sands. They are now moving their equipment to Fort McMurray, where they will start operations about September 1.

POSITION WANTED — A Canadian Mining Engineer, graduate of Canadian University, specialized in the geology, development and operation of iron mines on a large scale in the Western States, desires to return to Canada to follow up the iron industry. Can give best references. Apply Box 602, Canadian Mining Journal, Gardenvale, Que.

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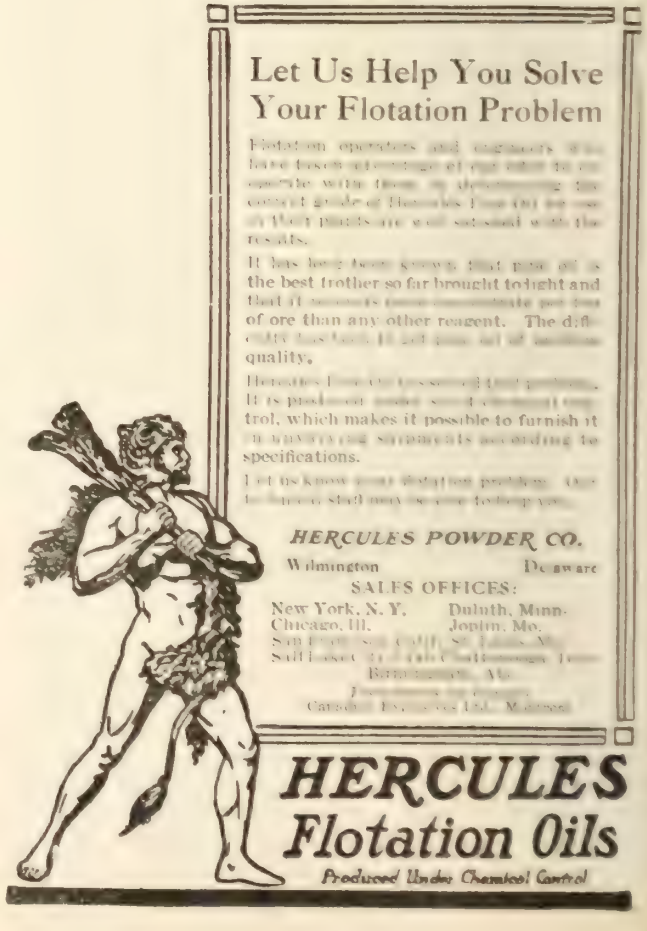

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One of the important features will be the presentation of ways and means to enhance labor productivity. The utilization of waste products will also be given special attention.

Exhibitors are making elaborate plans to have this year's exhibit surpass any showing made during previous years.

For further information address National Exposition of Chemical Industries, Grand Central Palace, New York

Ontario's Minerals

PROVINCE OF ONTARIO

DEPARTMENT OF MINES

Hon. H. MILLS, Minister of Mines

Mineral Areas.

Ontario, with its 407,262 square miles, contains many millions of acres in which the geological formations are favorable for the occurrence of minerals, 70 per cent of the area being underlain by rocks of pre-Cambrian age. The phenomenally rich silver mines of Cobalt occur in these rocks; so also do the far-famed nickel-copper deposits of Sudbury, the gold of Porcupine and Kirkland Lake, and the iron ore of Magpie and Moose Mountain mines.

Economic Minerals.

In addition to the above, practically all economic minerals (coal and tin excepted) are found in Ontario:—actinolite, apatite, arsenic, asbestos, cobalt, corundum, feldspar, fluorspar, graphite, gypsum, iron pyrites, lead, mica, molybdenite, natural gas, palladium, petroleum, platinum, quartz, salt, talc and zinc. This Province has the largest deposits on the continent of talc, feldspar, mica and graphite.

Building materials, such as ornamental marble, limestone, sandstone, granite, trap, sand and gravel, lime, Portland cement, brick and tile, meet every demand.

Mineral Production.

Preliminary returns show the output of the mines and metallurgical works of the Province for the year 1921 to be worth $48,128,387, of which the metallic production was $27,574,202.

The following figures show the rapid growth of Ontario's mineral industry by five-year periods since 1891:

Year.	Value.	Year.	Value.
1891	$4,705,672	1906	$22,388,383
1896	5,235,003	1911	41,976,797
1901	11,831,086	1916	65,303,822

Dividends.

Dividends and bonuses paid to the end of 1921 amounted to $23,140,734 for gold mining companies, and $84,388,185 for silver mining companies or a total of $107,528,919.

Mining Regulations.

A miner's license costs $5.00 per annum, and entitles the holder to stake out in any or every mining division three claims of 40 acres each. After performing 200 days' assessment work on a claim, patent may be obtained from the Crown on payment of $2.50 or $3.00 per acre, depending on location in unsurveyed or surveyed territory.

Assay Office.

The Provincial Assay Office at No. 5 Queen's Park, Toronto, is maintained by the Department of Mines for the free identification of minerals, free assays under the provisions of the Mining Act of Ontario, and also for general assay work as per the Schedule of Charges which may be obtained on application.

Temiskaming Testing Laboratories

The Department maintains, at Cobalt, an ore sampling and testing laboratory which is now prepared to receive parcels of gold ore from 100 pounds upward, and after sampling and assaying the same to pay to the shipper the value thereof, less treatment charges. The purpose is to afford a market for ores extracted by prospectors and others in developing their mining claims, enabling them to obtain funds which they can use for further work and to report on the most satisfactory method of treatment. Fuller information may be obtained on application to the Manager, Temiskaming Testing Laboratories, Cobalt, Ontario.

Publications.

For list of publications, illustrated reports, geological maps and mining laws, apply to

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Deputy Minister of Mines,
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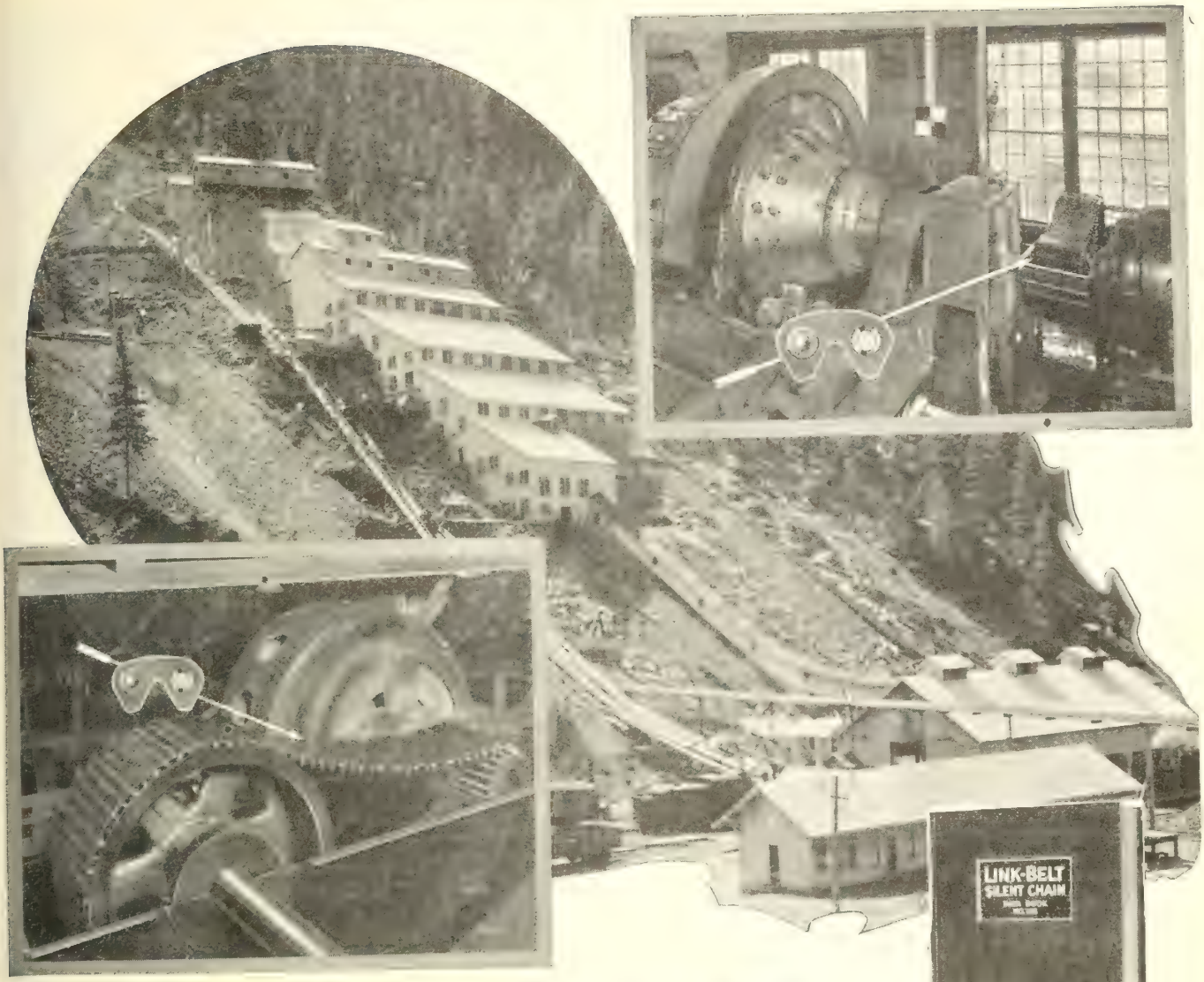

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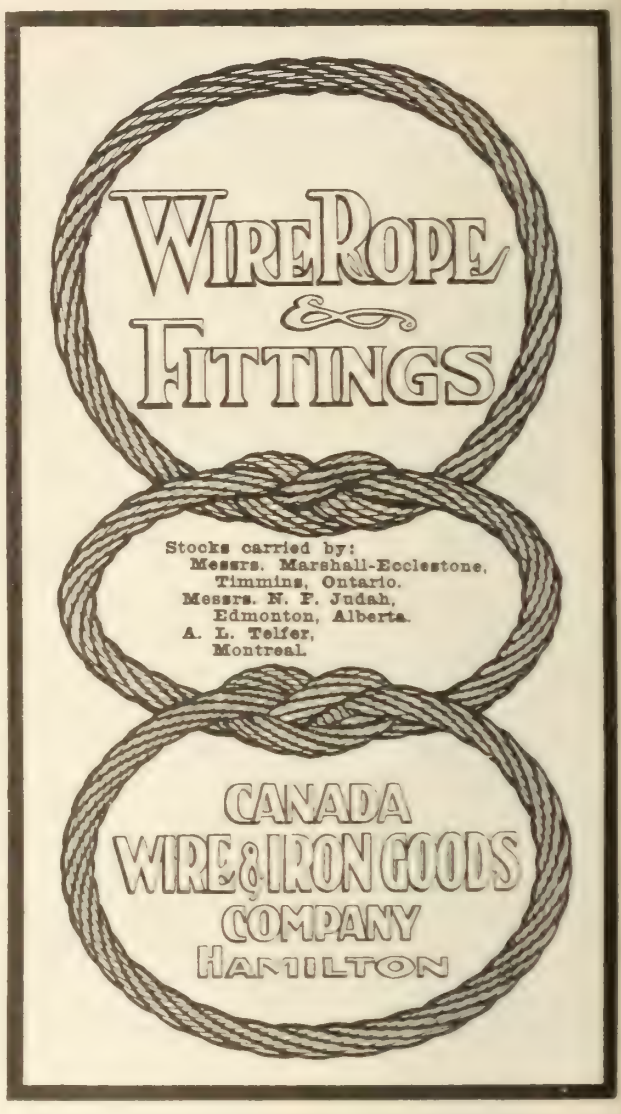
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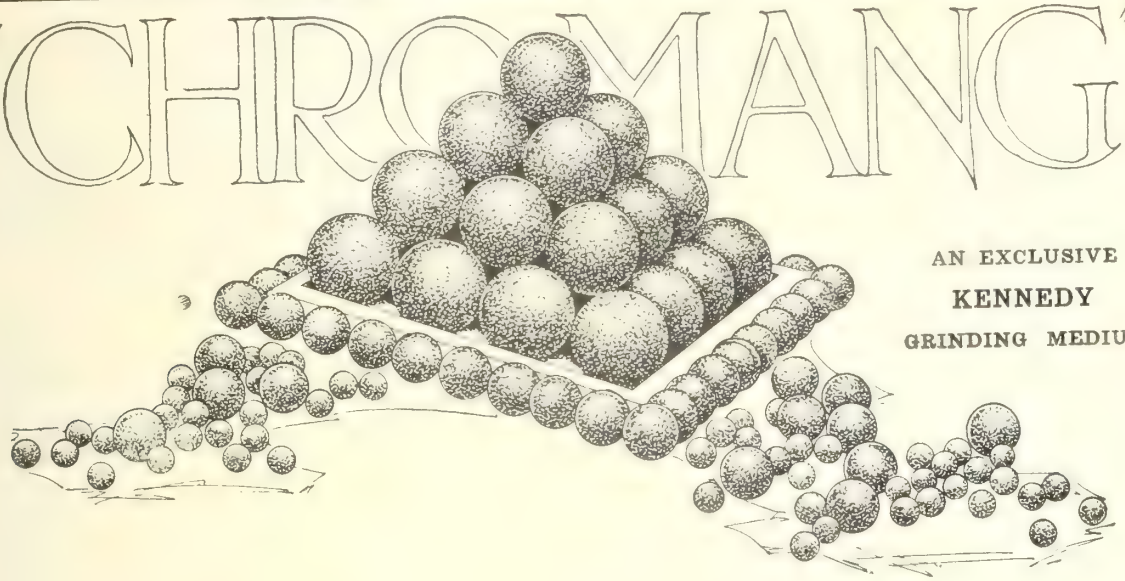

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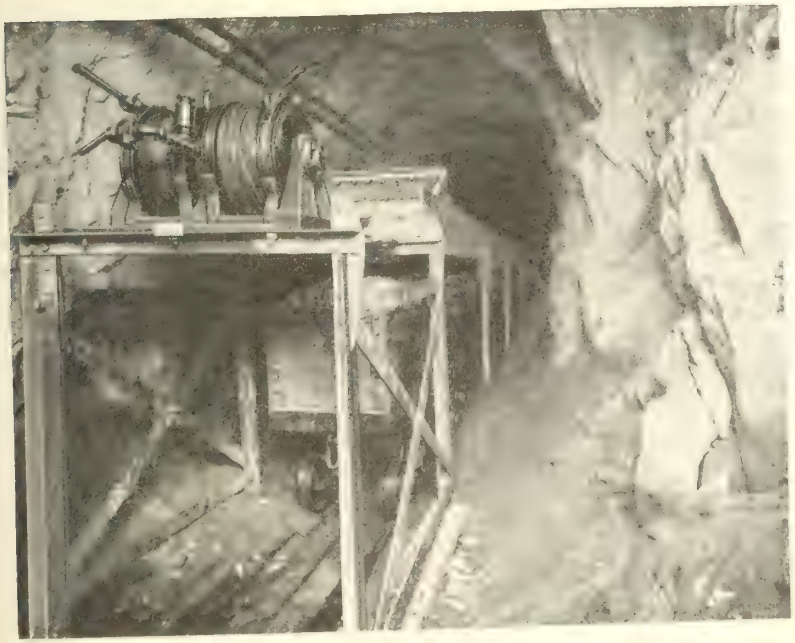

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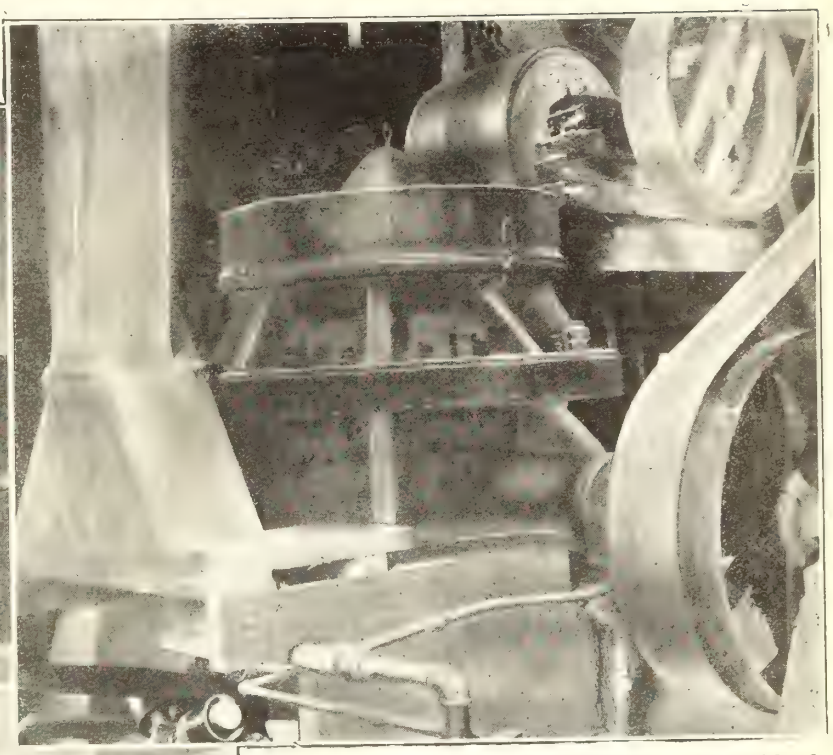

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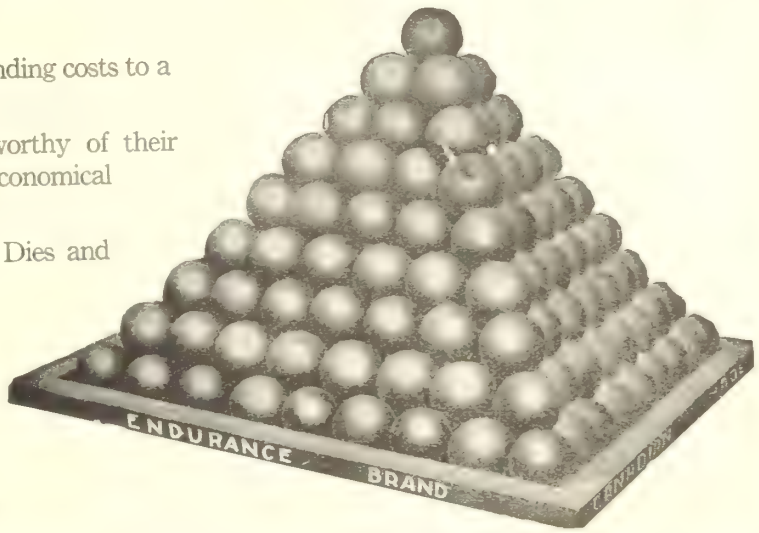

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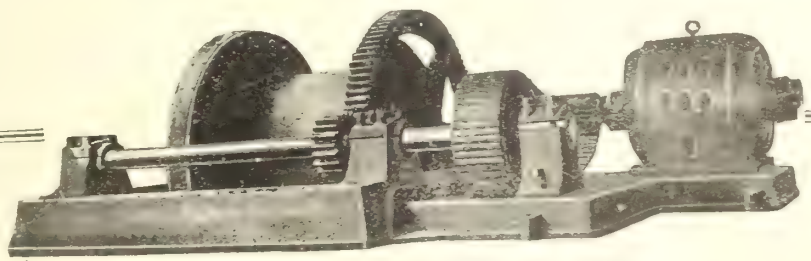

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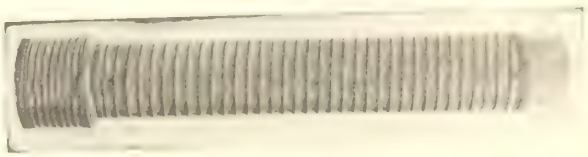

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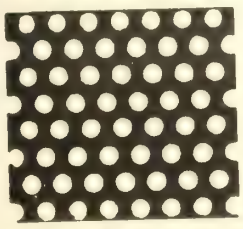

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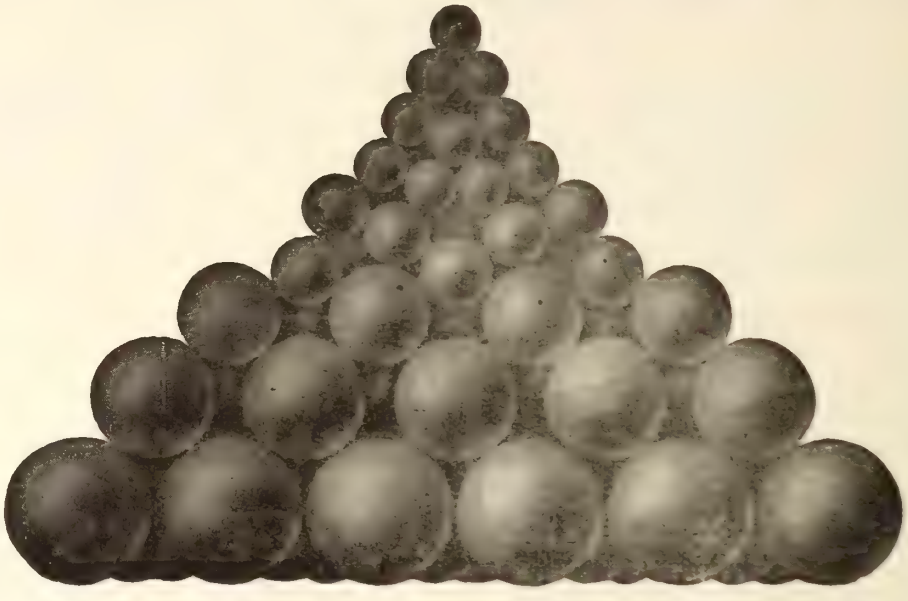

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PUBLISHED WEEKLY

Devoted to the Science and Practice of Mining, Metallurgy and the Allied Industries; and more particularly to their progress in Canada

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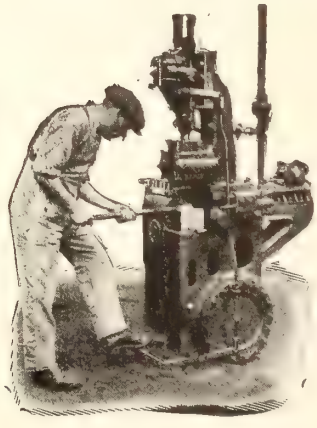

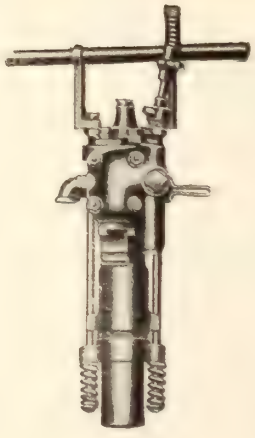

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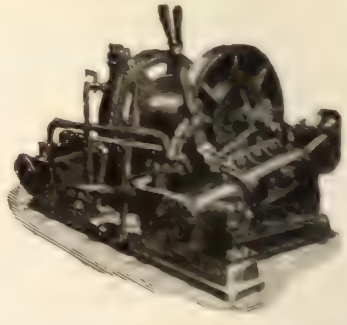

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:-: EDITORIAL :-:

GOOD AND BAD ADVERTISING

Both the Premier of Ontario and the Minister of Mines have stated publicly that they intend to let the world know the facts about the province's minerals. "Our light will no longer be hid under an agricultural bushel!" says Mr. Ferguson in an interview published in the *Journal* last week. "We must let the world know that the North will produce immense quantities of precious metals just as surely as the prairies will produce wheat," says Mr. McCrea in an interview published in the Toronto *Star*. Good! The more widely the facts of our mineral resources are known, the more rapidly will they be used, and the wider will be the market opened to them. We need capital, labour and enterprise combined to open up our mineral districts, and we can rest assured that the new Ministers of the Crown will follow up their stated intention with vigorous action.

Our mineral resources need advertising — of course they do. But they need good advertising, not bad. It is not long since a responsible public official stated boldly and without qualification that the northward extension from Cochrane of the Temiskaming and Northern Ontario Railway would open up a mineral district as productive as that to the south. He did not know what he was talking about, and had not taken the pains to consult those of his subordinates who knew the facts. That was bad advertising. We can trust Messrs. Ferguson and McCrea, both of them personally acquainted with the mining industry, to avoid any errors of that variety.

There is another form of bad advertising that is much more dangerous to our mining industry and much more difficult to control. Every time an investor is "stung" by a wild-cat mining scheme the industry loses a supporter, and gains either an out-and-out enemy or a cynical observer whose influence is worse than that of an enemy. The crooks who are formulating these schemes and "putting them across" are legion, and their number is increasing daily. Their dupes are unbelievably numerous, and are to be found in all walks of life. Among them are numbered thousands of men, shrewd and competent in their own lines of business, in addition to the greedy, the helpless and the foolish upon whom the stock-jobber depends for his steady income. The western provinces and the maritime provinces have adopted measures to palliate this evil. The Premier of Quebec has expressed his intention of regulating the issue of stocks, particularly mining stocks, in such a way as reasonably to protect the investor. Ontario has a "Blue Sky" Act on the statute books; but its application to mining stocks has been deferred until September 1st, and then it can be put in force only by order-in-council.

When the bill to regulate the rate of securities was before the Ontario Legislature last spring, Mr. McCrea, then a member of the Opposition, was an outspoken critic, and one of its chief opponents. He spoke of it as an imperfect piece of legislation, which of course it is, in common with all experiments in regulation. Not only this, but he condemned it as against the interests of the mining industry in general — for reasons we have still to discover.

Mr. McCrea is now in a position to regulate or even to control the principal advertising Ontario's mining industry will receive in this and all other countries— that resulting from the sale of securities based upon Ontario's mineral resources. If the prospectuses and advertisements soliciting capital for investment are statements of the truth, Ontario will benefit immensely, for the truth, as Mr. McCrea remarks himself, is sufficient inducement to draw widespread attention. If, on the other hand, exaggeration and lies are spread abroad publicly as representing our mining industry, the truth will never overtake them, and inevitably the industry will suffer.

It is obvious that the present regulation of the sale of mining securities is inadequate. The late Government of Ontario made an attempt further to regulate it. Mr. McCrea and other members of the present government considered the attempt misguided and opposed it. Now it is up to him and his colleagues so to modify the present Act as, at one and the same time, to conform with their own judgment and to protect the Canadian citizens whose best interests they have sworn to serve.

Prompt action is required, for the mining industry of Ontario is still the victim, daily, and needlessly, of the worst sort of advertising.

EXPLORATION IN GILLIES LIMIT

It is interesting to note that there has been, during recent months, a decided recrudescence of interest in the Gillies Limit. In the early days of the Cobalt camp, when this timber limit, adjoining the productive area on the southwest, was closed to prospectors in order to ensure protection from fire, it was supposed to contain fabulous riches. Development dis

closed little of value. At the Provincial Mine, discovered by employees of the Ontario Bureau of Mines and operated by them for a short time, there were found some pockets of high-grade ore in a well-defined vein of unusual width. A number of adjoining properties showed similar patchy values. The report that further bunches of high-grade ore have been disclosed by exploration in the Provincial Mine now in progress may presage the discovery of payable ore.

It is rumoured that the Mining Corporation intends to explore seriously some ground about three miles southward from the Provincial. There occurs here a sill of diabase much like the one that brought the silver into the Cobalt veins. Though no workable values have been found in connection with this more southerly sill, it is quite possible that underground exploration will disclose a third area of silver deposits similar in character to those at Cobalt and in South Lorrain.

A DANGER SIGNAL

On September 1st the Ontario Department of Mines will lose its Assistant Provincial Geologist. On that date Mr. Cyril W. Knight will take up his new work with the Nipissing in Cobalt. Ontario will lose a most effective public servant; but the Province's mineral industry will retain the services of one who has contributed much to its progress in the past, and will continue in his chosen sphere of work in a private capacity.

Mr. Knight has been on the staff of the Ontario Department of Mines almost continuously since his graduation from Queen's University in 1903. He assisted Dr. Miller to make his first map of the Cobalt district in 1904, and has followed in detail the fortunes of our famous silver camp ever since. In addition he has had a varied and well-rounded experience in the other mining camps throughout Ontario. Three years ago he was authorized to make a thorough and final examination of the productive area at Cobalt. Many thought of this as merely an *ante mortem* examination, interesting more in the light of a historical record than as of present utility. But Mr. Knight was much too wise a physician to give up hope while life still remained in the patient. His researches of the last three years, both on the surface and underground, based upon his previous intimate knowledge of the whole area and of similar geological occurrences throughout the world, have led already to the re-making of an old mine, the Colonial. It seems probable that numerous other mines will be developed or will be prolonged in life as a result of the clear-cut conclusions Mr. Knight has formulated and stated publicly as a result of his studies.

It is as a result of Mr. Knight's demonstrated ability to see farther into the rocks than other men that Nipissing Mines have engaged him to direct their exploration. While the veins were to be discovered on the outcrop or by following them underground in the ordinary way, the knowledge of the mining engineer was sufficient. Now there is required knowledge in addition to that possessed by the average mining man. The southeastern part of Nipissing's large acreage in the heart of the Cobalt district is covered by the diabase sill from whose intrusion the silver veins originated. The sill outcrops diagonally across the property from southwest to northeast and dips toward the southeast. The deep-buried contact requires exploration, and as underground prospecting is decidedly expensive, it will pay to have, at almost any price, the best qualified man to direct it. The Nipissing directors have decided that Mr. Knight is that man.

This brings up once again the vexed question of the remuneration paid to technical men in the public service. Rarely are their salaries in proportion to their services, particularly in the case of juniors, and often the pay is not sufficient to support a family in reasonable comfort. The scientist in public employ, unless he has a private income at his back, must take the satisfaction of work well done in the service of science as part of his payment. Only an enthusiast can do this. The fact that there is a substantial remainder of capable geologists in the public employ is a tribute to the compelling attraction of their chosen calling.

While it is an admirable arrangement that the various Departments of Mines should constitute themselves schools for the training of young geologists for the direct service of industry, the depletion of the ranks of highly trained public servants can be carried too far. When, as in the case of Mr. Knight, a private company bids for the services of a geologist, the public department cannot attempt to out-bid its rival. Nevertheless there is a happy mean to which, so far as we are aware, none of our Departments of Mines have as yet attained. There was an exodus of geologists from Ottawa two years ago; there are signs that a similar exodus, more complete though on a smaller scale, will take place from Toronto unless the salaries of the geologists employed there are raised to approach more nearly those obtainable in private employ. The Ontario Department of Mines parts with Mr. Knight with regret; it cannot afford to lose one more of its geological staff.

The danger signal is in sight. It is incumbent upon those steering the ship of State in Toronto to see that steps are taken immediately to protect the public interest.

OPERATIONS RESUMED AT SYDNEY

The colliery workers in the Sydney field are being re-employed as rapidly as places can be found for them to work. In some cases water and falls of ground have prevented places being opened to the miners; but such occurrences have been much less frequent than could have been expected after the prolonged shut-down. So far as is known publicly, there has been no discrimination against the bulk of the

strikers in re-employing the force of men; but all have been required to sign the check-off anew — that is, to join the re-organized District 26 of the United Mine Workers of America. This formal recognition of the authority of the international union includes, of course, adherence to the union tenets, among them the necessity for living up to agreements with the Company. The collieries are now fully manned, and we can look forward to a period of undisturbed prosperity in and about Sydney.

An incident in Sydney last week indicates the wisdom of having troops and provincial police on the ground during the period of disturbance. Explosive charges were put off over two spots on the water main that supplies the steel works, cutting off the supply completely for a day. This spirit of sabotage has long been in the air at Sydney, and, though it has infected actively only a small minority of the workmen in mine and mill, still the hare-brained escapades of these few might have had very serious consequences to life and property had not the law been represented by an armed force of preponderating proportions. The troops and provincial police are still on guard on behalf of law and order, and will remain so until the local civil authorities consider the danger of serious disturbance is past. Though the bulk of the miners and mill workers are once more "on the job," there is still a band of disaffected and disgruntled Socialists and Communists at large whose presence is a menace to the community. The British custom does not permit these disturbers of the peace to be rounded up and removed or jailed, as is the custom in other lands. It depends virtually upon the citizens of Sydney and the colliery towns and villages to meet the case themselves.

In general, the steel and coal strikes have resulted fortunately. The grievances of the steel workers, some of which are well founded and require adjustment, could not be met while good and bad were intermingled. There will be now an opportunity for the Company to consider these claims calmly and judicially, and we are confident that justice will be done. The colliery workers are at last rid of the small Communist minority that has led them by the nose during recent years. In this case too we can expect from now on a more friendly mutual relationship between employers and employees. From the indications we judge that a period of unexampled prosperity is ahead for Nova Scotia's coal and steel industries, based upon sound business and engineering management as well as upon a better mutual understanding between company and operatives than has existed for many a long year.

While Germany continues to preserve her virtual monopoly of the world's supply of potash, the discovery of similar beds in other parts of the world where rock salt is found is not improbable. Exploration is being conducted in Spain in beds of salt containing commercial, though erratic, values in potash. Borings throughout the United States are now being examined systematically where they pass through salt beds in order to test their potash content. The Malagash salt deposits on the Malagash peninsula on Northumberland Strait, Nova Scotia, contained in parts an appreciable amount of potash, but not sufficient to warrant an attempt to recover it. Messrs. Chambers and MacKay, who are operating the Malagash salt deposit, have taken steps to explore for salt in Hants County, on the south side of Minas Basin. Two boreholes put down at Cheverie encountered strong brines at depths of 1,400 and 1,870 feet. It is possible that the contemplated exploration of Messrs. Chambers and MacKay will disclose salt beds at a lesser depth, as in their Malagash beds. The new salt industry of Nova Scotia is in good hands, and will be developed vigorously.

Constantly there are announced in the technical press new developments in electro-chemistry and electro-metallurgy. On another page we print a notice of such a plant in Italy, making ammonia and nitric acid from air and water. A somewhat similar plant is being constructed in England by Brunner, Mond & Co., to make ammonium nitrate. These developments augur well for Canada, with her abundance of water-power. The huge power development now in progress at the Grande Décharge of Lake St. John, where it empties into the Saguenay River two hundred miles north of Quebec, must have some such outlet for its energy. Those who are behind the enterprise have made as yet no announcement of their purpose in this regard. We can conclude confidently, however, that the use of the tremendous amount of electric power that will be available there within four or five years rests upon commercially feasible electro-chemical or electro-metallurgical processes.

THE EFFICIENCY EXPERT

A Human Protest

He doesn't like the lay-out of the plant;
He disapproves, in manner arrogant,
The mining methods utilized below;
He hints that they are obsolete and slow.
In everything we try to do, indeed,
He signifies that we have gone to seed.
Efficiency's his battle-cry,—that word
By ordinary mortals deep abhorred.
Efficiency, as reckoned by *per centum*,
We'll let him have—do nothing to prevent him
From being most abnormally efficient,
Or posing as unhumanly omniscient.
But, by the gods! (we hope he'll take the tip)
His talk afflicts us with the purple pip!
So, Mr. Expert, pray abate your ardour,
Life's hard enough, don't try to make it harder!

J. C. M.

CHARLES McCREA

The recent change of government in Toronto has brought with it the assurance that the mineral industry will receive more consideration from the Ontario provincial administration than has been the case in the past. The new Premier was formerly Minister of Mines, and the knowledge gained in that position will give him a distinct advantage, as compared with former premiers, in dealing with mining matters. The present Minister of Mines, Honourable Charles McCrea, brings to his task the aid of a legal training and of over twenty years of residence and practice in Canada's leading mining camp, — Sudbury. He has represented the Sudbury district continuously in the

Hon. CHARLES McCREA
Minister of Mines for Ontario

Provincial Legislature since 1911, when he first stood for election, and on the floor of the House has always been the champion of the mining industry.

Mr. McCrea was born in Springtown, near Renfrew, Ontario, in 1877, and was brought up in the town of Renfrew. He studied law at Osgoode Hall and in the office of Hon. T. W. McGarry of Renfrew, ex-Provincial Treasurer of Ontario. In 1901 he was called to the Ontario Bar, and commenced practice in Sudbury, where he is now senior partner in the firm, McCrea & Valin. In 1921 he was created King's Councillor. Last month he was appointed Minister of Mines in the new Conservative government under the leadership of Hon. G. Howard Ferguson.

During his long residence in Sudbury, Mr. McCrea has of necessity gained an intimate knowledge of the mining industry, which permeates the whole life of the town and creates the larger part of its business, both legal and otherwise. That his interest in the mining industry is also from choice is demonstrated by his record of twelve years in Parliament. He has always taken a responsible part in the discussions relating to mining, and his obvious personal acquaintanceship with the subjects of discussion, which is a rarity in Parliament when mining is the subject, has given his statements and his conclusions authority and distinction.

Mr. McCrea has at his back a staff in the Department of Mines whose experience and ability are notable, not only throughout Canada, but wherever the mining industry of Ontario is known. This staff, old in experience, and with the accumulated wisdom of a long succession of political administrations, dating back to the beginning of the mining camp in which Mr. McCrea's personal interests are mainly centred, is the best possible asset to any Minister of the Crown in the discharge of his public duties.

Mr. McCrea is fortunate. He assumes public office not only with this Department behind him, but at a time, when the mining industry of the province is experiencing the greatest boom in its history. The responsibilities of the Minister of Mines are correspondingly great; and the *Canadian Mining Journal* is confident that Mr. McCrea will discharge these responsibilities in such fashion as will give him a notable place in the annals of mining in his native province.

SYNTHETIC AMMONIA

A plant has been established at Novara in Italy to make synthetic ammonia and nitric acid by the Fauser process. Hydrogen produced by the electrolysis of water, and nitrogen obtained as a by-product, to be explained later, are mixed and compressed to 300 atmospheres and when sufficiently hot, combine to form ammonia. External heat is required to start the reaction, but thereafter the heat of the reaction is sufficient. The ammonia is oxidized to nitric acid by the process of Frank and Caro, using oxygen from the air. The residual gas from this reaction is the pure nitrogen mentioned above. The plant has some ingenious devices conducive to economy, and there is every prospect of its being commercially successful.

PROSPECTING FOR SALT

A license to prospect for salt in Hants County, Nova Scotia, has been taken out by Messrs. Chambers and McKay, of New Glasgow, who are operating the Malagash salt deposits. The license covers an area of 35 square miles. Prospecting in this district will be watched with considerable interest, as salt has been discovered near Falmouth, across Minas Basin from Cheverie.

The Oil Engine for Mine Use

I.—General Characteristics, and Rating

(The power problem is ever before the mining man o an increasingly large extent the use of oil engines ffers either a partial or a complete solution of the roblem. The oil engine is a comparatively new source f power to the mining engineer, and he is not as yet oroughly acquainted with its characteristics. There re in circulation also a number of false notions about il engines, their uses and their capabilities. With a iew to presenting for the use of Canadian miners au horitative oil engine data, the *Canadian Mining Journal* as arranged for a series of short articles from one f the world's principal makers, who has now over a illion horsepower of these engines in use. Though he data and ideas presented are of general utility, the eculiar requirements of the miner and conditions in anadian mining camps have been kept in view. The irst of these articles follows. — Editor.)

Power. — The user is interested in the useful power hat the engine will give out over fairly long periods. This is less than the overload power that can be given n trial conditions for short periods. It is, therefore. ecessary to ensure that the engine be of ample size or the duty required, as it is manifestly unfair to com pare the conservative rating of one make with the ex treme temporary output of another. Most makers of epute state the maximum power they recommend for ontinuous running, which allows a margin under the maximum output possible.

For small engines the brake horse power, or the power actually available for doing useful work, is quoted, so no confusion is likely to arise by quotation of indicated horse power, to which reference will be made later; but it is just as well always to specify brake horse power (B.H.P.) in enquiries. Shaft horse power (S.H.P.) may be regarded as having the same practical meaning.

Height above sea level and temperature affect the power available from the ordinary engine. The power quoted by the maker will be that available at about sea level (say up to 330 feet above sea level) and at normal temperatures (say up to 75 degrees Fahrenheit). It is customary to allow a reduction of at least 1% in the power for each 5 degrees Fah. rise in temperature above 75 degrees Fah., and for each 330 feet above 330 feet in elevation, or 3% for each 1,000 feet. The reason is that at high temperatures and altitudes the air becomes attenuated or less dense, and there is less weight of air in the cylinder to burn the fuel.

Fuel. — The power quoted is usually based on fuel oil of average quality, say not over 0.9 specific gravity, and 18,000 British Thermal Units per pound. The majority of fuel oils come within this description, but if any specially thick or poor fuel oil has to be used it is necessary to state this fact when enquiring. Clean fuels obviously lead to more comfortable running, and less frequent cleaning, than do coarser fuels, and it is often more economical in the long run to use more expensive fuel than the cheapest.

A high viscosity in itself is not necessarily a great difficulty with fuel, as by warming it can be made sufficiently liquid for use. It is as well, however, when using viscous fuel to run for a short time before stop ping on a more liquid fuel that will not solidify in the pipes and pumps and thus make starting difficult.

High viscosity fuels are more apt to hold water and dirt in suspension.

Asphalt is the most difficult constituent in some fuels, as a portion is apt to coke and to form deposits and grit in the engine. Sulphur in the fuel does not appear to cause trouble in its combustion as the gas passes away at too high a temperature to cause corrosion. On cooling down after stopping, acid is apt to form, while exhaust fumes in the air will cause trouble in air compressors. Makers of engines are generally prepared to advise as to the fuels suitable for their engines.

Cycle. — Two-stroke engines have their cylinder covers, liners and pistons subjected to more heat stress than four stroke engines, as there are twice as many impulses for the same number of revolutions. In large engines heat stresses become important, and on this account a lower output per impulse is required with a two-stroke engine than with a four-stroke, if one assumes the same degree of durability for both. For engines of the semi-Diesel type the rating is usually very low, and this point of durability is automatically met; but in large engines care must be taken in accepting the claims made for the two-stroke engine, which are often exaggerated. The main point in a two-stroke semi-Diesel engine of reliable make is its extreme simplicity, which offsets the advantages in other directions that may be claimed for a four-stroke engine in the same field.

Rating of Engine. — The power of an engine can be measured by taking indicator diagrams, as is done with a reciprocating steam engine, or by measuring by a brake or dynamometer the actual rate of work delivered at the coupling. The former gives the indicated horse power (I.H.P.), the latter the brake horse power (B.H.P.), the latter often known as shaft horse power or useful or effective horse power. The ratio $\frac{\text{B.H.P.}}{\text{I.H.P.}}$ is the mechanical efficiency of the engine (E), or

$$E. = \frac{\text{B.H.P.}}{\text{I.H.P.}}$$

Knowing two of these three values, the third can be at once found. E may vary from below 70 to well over 80, according to the type and size of engine; so the I.H.P. is obviously a poor guide to the useful power (B.H.P.) unless E is known.

Mean Pressure. — From the indicator diagram we can calculate the mean indicated pressure (i.m.p.) and by using the formula below, the I.H.P. is derived. Conversely the i.m.p. can be calculated, given the I.H.P. and the engine particulars.

$$\text{I.H.P.} = \frac{\text{i.m.p.} \times 1 \times a \times n}{33000}$$

(for a two-stroke single acting engine)

$$\text{or} = \frac{\text{i.m.p.} \times 1 \times a \times n}{2 \times 33000}$$

(for a four-stroke single acting engine)

where 1 = length of stroke of engine in **feet.**
a = area of piston in square inches.
n = number of revolutions per minute.

i.m.p. = mean indicated pressure in lbs. per square inch.

The mean indicated pressure is a guide as to the heat effect per impulse.

Corresponding to this is the brake mean pressure

$$\text{B.H.P.} = \frac{\text{b.m.p.} \times 1 \times \text{a} \times \text{n.}}{33{,}000}$$

(for a two-stroke single acting engine).

$$\text{or} = \frac{\text{b.m.p.} \times 1 \times \text{a} \times \text{n.}}{2 \times 33000}$$

(for a four-stroke single acting engine)

The ratio between i.m.p. and b.m.p. is obviously the same as between I.H.P. and B.H.P.

The b.m.p. is useful as a guide to the pressure rating of engines of the same type and speed.

The stroke multiplied by twice the number of revolutions, or $1 \times 2n$ gives the piston speed, which is a rough guide as to speed rating of the engine.

THE GEOPHONE*

The geophone is a sound-ranging instrument invented by the French during the war. The form of the instrument was developed by the U. S. Army Engineers and the U. S. Bureau of Standards. Later the sensitiveness of the instrument was increased by engineers of the U. S. Bureau of Mines. The instrument is, in principle, a seismograph and is entirely mechanical in its action. The geophone consists of a flat iron ring about 3½ inches in diameter and ½ inch in thickness, in the center of which is suspended a lead weight fastened with a single bolt through two metal discs, or diaphragms; one of these diaphragms covers the top, the other the bottom of the iron ring. There are two brass cap pieces, the top one having an opening in the center to which is fastened a rubber tube leading to a stethoscopic earpiece.

If the instrument is placed firmly upon the ground and there is any pounding or digging in the vicinity, the case of the instrument will vibrate with the earth. The lead weight, because of its mass, will, however, remain comparatively motionless, since it is suspended between the elastic diaphragms. There is thus produced a relative motion between the diaphragms and the case. This motion alternately compresses and rarefies the air in the spaces between the cap pieces and the diaphragms. The air waves thus set up within the instrument are then transmitted to the observer's ears by means of the rubber tubing and the earpieces. The small enclosed air-space in the bottom of the instrument, between case and diaphragm, serves to dampen the vibrations of the diaphragms. It is customary to use the geophones in pairs, connecting one instrument to each ear. The direction of a sound from an observer can in this way be determined with considerable accuracy on the binaural principle of direction determination, as has already been outlined in Research Narratives No. 18 and No. 51.

The diaphragms in the original instruments were mica. It has been shown, however, that metal diaphragms are more sensitive and more durable. A nickel diaphragm .025 inch in thickness is perhaps best. The thickness of the diaphragms is apparently limited by the ability of the enclosed bottom air pocket to prevent undue vibration.

To give some idea of the sensitiveness of the instrument, it may be said that under suitable conditions sledge pounding has been detected over three thousand feet through solid rock in a western metal mine, that the same pounding has been detected two thousand or more feet through coal, five hundred feet through mine "cover," and about three hundred feet through clay. External noises, such as those caused by light winds, or machinery running nearby, greatly interferes with the successful operation of the instrument. The characteristics of the sounds are transmitted very accurately through the geophone. This means that one can easily judge the nature of the machine or instrument making the sound. Talking can be heard through an ordinary 50-foot coal pillar with about the clearness of the old-fashioned phonograph.

While the geophone was first used to detect the underground mining operations of the Germans, it has been successfully applied to many peace-time purposes. The instruments may frequently be of value in locating and rescuing miners who have been entombed in a mine disaster. They have also been used successfully in establishing roughly the relative positions of approaching tunnel headings, and may thus serve to prevent accidents incident to blasting through unexpectedly. Then can frequently be employed in determining the drift of churn-drill holes, and experiments with diamond drilling seem to indicate that under certain conditions they would serve the same purpose with such drills. While it might not always be possible to follow the drill from the surface, it is certain that if the hole were being put down ahead of accessible workings the geophones might be useful. Under exceptional conditions they have served in locating mine fire areas. Usually the sounds from such a fire are too weak to be transmitted any great distance. Most satisfactory results have been obtained in locating water-pipe leaks, and one mining company reports success in locating leaks in compressed air lines buried along their entries. They report, however, that they were unable to detect the very smallest leaks.

PERSONAL AND GENERAL

Mr. J. U. MacEwan, recently chemist at the lead smelter of the Kingdon Mining and Smelting Co. at Galetta, Ontario, is now superintendent of the smelter. He succeeds Mr. F. S. Warren, who has returned to the United States to take a position with the Evans Lead Co. in Forestia, Ohio. Mr. MacEwan's friends will be interested to know that he is no longer a bachelor.

Professor S. N. Graham left last week for a three weeks trip in northwestern Quebec.

Mr. Andrew G. Larsen of Spokane, Washington, has returned from Stewart, B. C., after inspecting a number of claims in the Portland Canal district.

Mr. E. Mc G. Quirk, of Montreal, has been appointed Chairman of the Conciliation Board that is considering the demands of the Porcupine miners for higher wages.

Mr. Thos. Riggs, Vice-President of Continental Mines, has been visiting the company's properties in Cobalt and Kirkland Lake.

Mr. Robt. A. Bryce, of Toronto, has returned from Porcupine and Cobalt

Mr. M. C. H. Little has returned to Canada from Italy.

* Research Narrative No. 61 Engineering Foundation, By Alan Leighton, Physicist, Bureau of Mines.

Rubber Lined Ball Mills

A new Use for Rubber — Ball Mills with Rubber Lining Outwear Steel — Construction and Production Advantages

(From The India Rubber World)

Two Types of Ball Mills

Ball mills are extensively used in the mining industry for breaking up ores. There are two types of mills in common use; the principal one is the cylindrical ball mill that ranges in diameter from 5 to 6 feet and from 16 to 22 feet in length. These mills are practically steel shells that vary in thickness from ⅝ to ¾ of an inch and are provided with flanges at each end to which the heads are fastened that carry the bearings upon which the shell revolves. The other type is known as the conical mill, which is comparatively short and in diameter ranges from 10 to 12 feet. The body of this mill is usually constructed of grey iron or steel castings.

Steel Protective Linings

Both types of mills are fitted with inside linings which may be removed when worn. Then object of these linings is to protect the main shell against wear. In order to resist the abrasive action of the ore, these linings are chrome or manganese steel castings that vary from 2 to 3 inches in thickness and are therefore quite heavy. This means considerable cost for material and also for power required to drive the mill. The principal objection to the use of steel linings is due to the fact that they gradually wear out the shell due to the constant friction between the lining and shell, aggravated by small particles of the reduced ore. The cost of a perfect fit between the heavy castings of the lining and the shell, is prohibitive. This is clearly true of both the cylindrical and conical types of ball mills. Indeed, this condition is so serious that the tendency is toward making cast steel shells of 1½ inches in thickness and over in order to insure long life despite increased cost, weight, and greater power consumed.

In comparatively small installations there are 4 to 6 ball mills in operation, while larger plants have from 10 to 20 and sometimes 30 mills or more. The shut-down for replacing steel linings in a mill requires two days at least. In the case of a mill handing 100 tons per day of a recoverable mineral value of $10 per ton, a production loss of $2,000 per mill is the result of this loss of two days' time. As a rule linings are replaced three times in two years and therefore the production loss per mill per year amounts to $3,000.

Briefly stated the objections to the use of metal linings are as follows: Cost, weight, increased driving power, abrasive wear on the shell, shut-downs and cost for replacement of parts.

Advantages of Rubber Linings

Experimental ball mills are now in operation wherein sheets of rubber are being used in the place of the ordinary steel linings. These rubber sheets are approximately 7 to 8 feet long and about 16 inches wide and ⅝ of an inch thick. These rubber sheets are made in convenient size and afterwards cut to fit the inside dimensions of the mills.

The advantages of using rubber sheets in ball-mill construction are as follows:

1. The lining weight is greatly reduced, hence less power is required for driving the mill. On the basis of power per ton of finished product the comparison between steel and rubber is in the ratio of about 17 to 13 or a saving of nearly 24 per cent. There is less load on the bearings, which last longer.

2. Due to moisture in the ore and introduced with it, the inside of the shell is soon covered with rust, to which the rubber lining freezes, holding it firmly in place and eliminating friction between the lining and shell.

3. The advantage under paragraph 2 prolongs the life of the shell.

4. The initial as well as the up-keep costs are greatly reduced. Chrome or manganese liners 2 to 3 inches thick cost about 11½ cents per pound. Rubber will cost from 55 to 70 cents per pound. The difference in weight will all be in favor of rubber.

The advantages in favor of rubber from the production standpoint are:

1. The capacity of tube or ball mill is in proportion to its diameter. The substitution therefore of metal linings 2 to 3 inches thick by a rubber lining only ⅝ inch thick materially increases the output.

2. In a metal-lined mill the ore as well as the balls slide readily over the inside surface; not so in a rubber-lined mill.

Observations have shown that in a rubber-lined mill the working zone is materially increased and the inert zone reduced. This is assumed to be due to the fact that the ore and ball mass, pressing against the rubber, is prevented from sliding and does useful work.

3. Experience has shown that a rubber lining averages 13 months of usefulness before it has to be replaced, as compared with 8 months for a steel lining.

4. The relining of a mill with rubber is a very simple operation. A mill can be relined in one-half day or in one-quarter the time consumed when using steel linings. Due to the limited weight of the rubber strips they are readily removed and the new ones rolled up are introduced through the manhole into the mill. The cost of labor in relining is thus cut down.

5. More important than the last consideration, however, is the fact that the rubber-lined mill at the time of relining is kept out of production only one-half day as against two days for a steel-lined mill, steady production being of prime importance.

Rubber Linings in Operation

The use of rubber for mill linings is at present being demonstrated at the mills of a prominent mining company, where a mill completely lined with rubber ⅝ of an inch in thickness is in operation. The mill has been in uninterrupted operation for 3 months, and no appreciable wear of the lining is noticed. The ore handled is of medium abrasive quality. The process has evidently passed the experimental stage and seems established. At present a mill is being fitted out for coarser work, taking ore at 2 inches diameter and reducing with large balls to ½ inch and finer.

Patent applications covering this invention have been made in the United States, Canada and other countries.

Steady shipments of Swedish iron ore are being made to the eastern seaboard of the United States. West bound freight rates favour this traffic.

Mining and Advertising*

To Create New Markets and Stimulate Old Ones is Part of the Miner's Problem

By JAMES H. COLLINS

Some years ago a wonderful deposit of nickel was found in the Sudbury district of Ontario — a bonanza for Canada, because it gave her something to sell the United States that is not produced in our own borders. Yet if Canada found another such nickel deposit tomorrow, it would be valueless; for Sudbury itself can produce more nickel than the whole world needs. For the same reason, an antimony mine would have no market value.

Some metals are in such good demand that their mining is steadily profitable. The world's supply of platinum is never adequate for its needs. Tin is absorbed about as fast as it is mined. But they are very few, these minerals with an adequate market. Generally, the miner can produce far more of a given metal or non-metallic mineral than the world wants. Among the staple metals, those needing more consumption are gold, silver, lead, zinc and copper. Among the rare metals, platinum is almost the only one with a hungry market. Cobalt, vanadium, magnesium, tellurium, cadmium, bismuth, uranium — these all have unsolved marketing problems, the possible production far exceeding demand.

Some "Rare" Metals a "Nuisance"

The public calls them "rare," but to the miner they are "nuisance" metals, or have been in the past, getting in the way when he extracts marketable minerals.

Platinum was a "nuisance" metal when the Spaniards first found it mixed with gold in the West Indies, and threw it aside as valueless. Today it is more costly than gold, and estimated on that account in jewelry. It is also a highly useful metal, making laboratory utensils with a very high melting point, not affected by most chemicals, and also valuable in dentistry, as a catalytic agent and for electrical purposes such as contact and ignition points.

Tungsten was a "nuisance" metal twenty-five years ago, and miners complained bitterly because it had to be taken out with silver and thrown on the dump. When it was adapted to incandescent lamp filaments it became more valuable than silver.

What Was Done With One "Nuisance" Metal

Canada has an outstanding "nuisance" metal in cobalt, which is found in Canadian silver ores to such a degree that 175,000 tons of silver ore contain 7,000 tons of cobalt. Apart from its limited use as a blue coloring substance there is little demand, and thousands of tons have accumulated as residue at the smelters. But the possibilities in such metals were shown by Elwood Haynes' invention and advertising of "Stellite," an alloy of cobalt with another rare metal, chromium, which contains no iron, yet as a machine-tool metal will work at speeds that burn up the best tool steel, and take cuts that would crumble steel. Laboratory uses have been found which may ultimately be commercialized to put the cobalt market on a tonnage basis. Small percentages in pure iron make non-corrosive alloys which might find uses in roofing and sheet metal. Cobalt electrically plated on steel and brass gives a more adhesive coating and a better appearance than nickel, which it resembles. More costly than the latter, it can be deposited several times as fast and is less easily corroded. It is also used to some extent in coinage and German silver.

The Advent of Vanadium

Few advertising men realize how broad this field is, or how consumer interest may be needed tomorrow for the development of new uses discovered in the laboratory.

Twenty-five years ago few people outside the laboratories knew that there was such a metal as vanadium. Hiorns' comprehensive treatise on metals and alloys, dated 1901, makes no reference to it whatever. Del Rio isolated it from a Mexican lead ore in 1801, but his discovery was discredited until Sefström confirmed it thirty years later. In 1900, some Pittsburgh steel men, having vanadium deposits in Peru, undertook to create a demand for this unknown product. As a laboratory proposition it had been found valuable in imparting anti-fatigue properties to steel, but the steel men had not taken it up. The Flannerys had some first-rate technical articles written by metallurgists and engineers, showing the superiority of vanadium steel. Booklets were also prepared, but no periodical advertising done, chiefly because the promoters didn't know how to go about such a campaign. In the course of their promotion work, they interested Henry Ford, who adopted vanadium steel for his cars. That gave it the greatest single impetus, because Ford told the public about the advantages of this alloy steel in wear and lightness. Another novelty that brought wide publicity because it was something appealing to the popular imagination was a "vanadium shovel," having wearing properties and lightness due to vanadium steel. Today the market for vanadium steel is being still further increased by the advertising of several tool and machinery manufacturers who use it in their products.

The Copper Problem

Even the commonest metals have undeveloped advertising and marketing possibilities.

Take the best advertised metal of the moment — copper. The public has not only responded to publicity pointing out the durability of copper, but manifested widespread interest in copper advertising as information. But the use of the red metal for roofing, plumbing and hardware is just a beginning in the possibilities.

Only yesterday, for example, copper was thought to be "poisonous" to iron, and even Government contracts specified that iron should contain not more than a certain percentage of copper. Metallurgists were set making tests. They demonstrated that, far from being injurious, copper improved iron and steel, making them resistant to corrosion. As an outcome

* From "Printers' Ink," June 14th, 1923.

of advertising in technical journals, this old superstition has been scotched and Government contracts now specify certain percentages of copper in iron and steel.

A New Demand For Copper

A growing new demand for copper is found in the use of copper sulphate for purifying city water. A very small amount of this chemical, about two pounds per million gallons, added before filtration, kills vegetable pollution and removes unpleasant flavors. Copper shingles, coper kettles and other articles are also used, now advertised in large space. Copper sulphate is being used in building a new type of road, three per cent added to asphalt protecting the latter against "running" in hot weather. Copper oleate is used for impregnated fish nets so they will not be affected by marine pests, replacing tar which has always been used for that purpose. Copper alloyed with steel, the American Sheet & Tin Plate Company advertises, adds to the permanence of black and galvanized and roofing tin plates.

It may be well be that later on, when the merits of copper metal have been impressed through advertising, the research association will turn to the many brasses made by alloying copper with other metals. The public knows the bright golden brass of the kitchen faucet, made of copper and zinc, but it does not know the many white and red brasses in which nickel, tin, lead, iron, gold and other metals are also used for jewelry, silverware and other purposes. "German silver" is really a white brass made of copper and nickel. And so with the bronzes, which are copper-tin alloys to which other metals are added for ornamental and utilitarian purposes — "gun-metal" is a familiar example known to everybody.

$100,000 a Year to Advertise Zinc

Zinc is another every day metal that needs advertising—needs it so badly, in fact, that a campaign was started several years ago by the American Zinc Institute, but halted by the business depresssion. The advertising was resumed recently and in May of this year the institute passed a resolution "to perfect and execute a plan to raise and expend all of the moneys so raised in a sum not exceeding $100,000 for the purpose of conducting a national advertising campaign for zinc products for the coming year." Like copper, it goes on the toboggan slide in hard times, falling below the cost of production, and even in normal times could be mined in much larger quantities than are needed. Unlike copper, which we export, there is vigorous foreign zinc competition in our metal markets.

Zinc needs advertising even more than copper because it is handicapped by popular prejudice. People generally know the virtues of copper without being told — the only question in the public mind is that of cost, with which advertising is dealing. But one of the principal uses of zinc is for galvanizing iron and steel. Because the latter are perishable and eventually rust, the public has come to believe that zinc is also perishable when it is really a most durable metal when pure, taking on a firmly adherent coat of zinc suboxide that protects it from the atmosphere. It has also been handicapped by such nicknames as "spelter," a mediaeval Low German term for pewter and solder, now used chiefly in the brass industry for ingot zinc. Still another marketing handicap in this industry was pointed out by Charles M. Schwab who, in speaking to zinc men several years ago, expressed surprise that they had so many business secrets in the way of cost data, the operation of mines and the reduction of the metal. This has undoubtedly saddled the industry with wasteful methods and kept up production costs.

A Way to Increase Sales

One excellent way of selling more zinc, it is said, would be improving the quality of galvanized articles. Another, to encourage the use of pure sheet zinc for cornices, gutters, roofs, eavetroughs and so forth. During the war there was an extensive development of our zinc rolling facilities, the metal being used for lining cartridge boxes and other military purposes, and these facilities are not being employed anywhere near capacity. Great quantities of zinc oxide are used as a filler to improve the resiliency and durability of automobile tires.

The public never thinks of lead and silver as twin metals, but they are to the miner, from both the production and marketing standpoints. A considerable proportion of these metals is extracted from ore that contains both, and according to the state of the market, one is a by-product of the other, sometimes silver paying for the extraction of lead and vice versa. On this basis, a great deal of silver is mined at a profit because lead pays part of the cost where pure silver ore cannot be profitably worked.

Lead and Telephones

In hard times, lead goes on the toboggan slide with copper and zinc. American producers are put under a handicap by imported foreign lead. Indirectly, advertising is constantly creating new lead consumers, for 10 per cent. of our total output is used in the telephone industry as covering for telephone cable — the Western Electric Company purchased 53,000,000 pounds for that purpose in 1921. Another indirect consumer lift is given in the advertising of modern bathrooms and sanitation, for the metal is used for plumbing, water, gas, and fuel pipes. Still another important new use, created largely through the advertising of handy packages for dentifrices and toilet goods, is the collapsible tube, made sometimes of pure tin, but sometimes alloyed with lead. The metal is also used for solder, type metal, weights, sinkers, storage batteries, bullets, shot and lining for acid-proof tanks. The National Lead Company is also spreading a better knowledge of lead in a special campaign.

Silver a Cheap Metal

Silver is not a precious metal to the miner. By and large, it probably sells at a closer margin than steel. The North American continent is the greatest producer, and Asia the largest consumer in bullion and coin. The moving picture industry has created an important new outlet in recent years — leading film manufacturers are said to use three tons weekly, or one-twelfth the domestic output. Considerable quantities are used for still photography, mirrors, silver-plating, indelible ink and like purposes. But the most promising market for this metal, say investigators, is in the substitution of sterling silver for plated ware — that is, substituting silver for its own substitutes. The cheapness of silver until recently was not properly demonstrated to the public. The International Silver Company is advertising to dispel this misconception. An interesting argument formerly used by Tiffany's clerks — it

may still be used today—was putting sterling silver articles like spoons on the scales and figuring their close approximation to the value of silver bullion per ounce. Generally, solid silver is much better value than plated ware, manufacturers maintain, partly by reason of the higher value of the raw material, and partly because silver, being softer than the alloys from which plated ware is stamped, can be much more easily worked.

Gold is another problem to the miner. It is sold at an unvarying price all over the world but production costs are not "pegged," and since the war they have been higher than the value of gold in so many cases that production is not profitable. Besides being the basis of currency, gold has many industrial uses, quantities being worked up into jewelry, beaten into gold leaf for gilding, signs, the branding of pencils, hat bands and other goods, and it is also used in dentistry. But advertising to increase these outlets will not increase the price, so of all metals gold presents the knottiest marketing problem.

Studies of Marketing

Almost the first attention given to marketing metals and minerals is a series of articles in *Engineering & Mining Journal-Press,* each devoted to a single product. Some of these articles have been written by engineers, others by metal dealers, and still others by Government experts, and they will appear ultimately in book form. They deal largely with the commercial channels through which metals pass from the mine or smelter to purchasers who buy them as raw material. The consumer and advertising angles of marketing are occasionally touched upon, but only suggestively.

Many of these products the advertising man will never have heard of, much less their marketing problems.

There are selenium, tellurium and cadmium, three sad cases of metals in abundant supply with negligible consumption. They are used to some extent in medicine and for tinting or decolorizing glass. Magnesium is a lustrous silver-white metal, a light-weight relative of aluminum and beryllium, of which small quantities are used in flashlights and fireworks, but with nothing like the demand that is needed to make it a sound mining proposition. Of tellurium only a few hundred pounds are used yearly, for coloring glass, making dyes and medicine staining silver, and as an ingredient in re-resistance alloys. But new possibilities are suggested by a recent discovery that it makes an anti-knock and carbon-eliminating compound for automobile use.

A story told of palladium, one of these rare metals, reveals a market obstacle of a peculiar kind. Palladium is used to a limited extent in chronometers, watches, surgical instruments and other delicate apparatus. Technologists suggested that $1,000 might be spent profitably to develop other uses, but the principal producers of palladium, according to the story, said that while they didn't mind spending the money, they would do nothing to lower the price of palladium by increasing consumption.

What Advertising Did for Aluminum

When the advertising man begins talking to the miner, let him bear in mind the astounding development of the first advertised metal—aluminium. When he was a kid, glowing predictions about what this wonderful light metal would do constantly appeared in the press. It was well known by hearsay to most people before they ever saw a specimen. The first marketing of aluminum was in the form of disc like coins, sold for a nickle apiece . With cheap methods of extraction, aluminum has gained a reputation as the "heavy duty metal," replacing other metals in automobile parts, being widely used in the form of alloys, and popular with the housewife in advertised aluminum utensils. Despite competition of foreign aluminum, it is practically the only non-ferrous metal that shows considerable increase over pre-war figures of production and consumption. Copper, zinc and tin have suffered decreases from 25 to 60 per cent, but aluminum holds its own, and unquestionably the advertising of aluminum utensils to the public, and aluminum alloys and parts in technical publications, together with its original appeal as a novelty, has done the business.

Research and the Advertising Man

One chap the advertising man must keep close to in this new and almost unexplored field of marketing. That is the technical man who seeks new uses for the neglected metals and minerals. In the laboratory of the metallurgist and chemist, and the office of the engineer, promising new uses may be found any day, and consumer or technical advertising will be needed to put them on a commercial basis.

Canada's joy at the discovery of the Sudbury nickel deposit was dampened somewhat by the later discovery that much of the ore contained copper, which was difficult to separate. "Why separate them?" asked Ambrose Monell, a metallurgist, and studying the alloy smelted from the metal as it came from certain parts of the mine, containing nickel, copper and traces of other metals, he found that it was a valuable new alloy in itself. Thus "Monel metal" was originated and patented, with such virtues of its own that with technical exploitation and advertising, it has become an important separate product of the Canadian nickel industry.

So let the advertising man keep close to the metallurgist's elbow, for each, in his own technique, will undoubtedly have marvels to show the other.

INTER-IMPERIAL TRADE

Canadian importers who are desirous of establishing connections with British manufacturers and ascertaining the best sources of supply, should avail themselves of the services rendered by the Information Bureau of the British Overseas Trade Association Ltd., Imperial Buildings, 56, Kingsway, London. All such information is furnished free of charge, the Association having recently been formed to foster trade within the Empire, and the gentlemen who are responsible for the organisation are practical business men with many years experience of buying and selling in the export market.

GYPSUM

During 1922, 3,779,949 tons of gypsum was mined in the United States. Of this approximately 2,500,000 tons was calcined, its value in the various products resulting being $27,000,000. Neat plaster, wall board and stucco were the principal products. In addition 770,725 tons of crude gypsum was sold for $2,443,346.

Canadian Ingersoll-Rand

The Company's History, its Plant and its Products

The Canadian Ingersoll-Rand Company is one of the oldest and best known makers of industrial machinery in Canada. The shops that commenced operations a third of a century ago, when our industrial organization was extremely youthful, have been expanded to a size and complexity in accordance with our present highly organized industrial system. The steady rise of this company to its present position of importance is typical of those substantial corporations that progress and endure almost with the centuries. Thorough workmanship, business morals of the highest order and policies formulated in accordance with the fundamental laws of economics are the solid rocks upon which such a business is built.

Has Grown with the Mining Industry

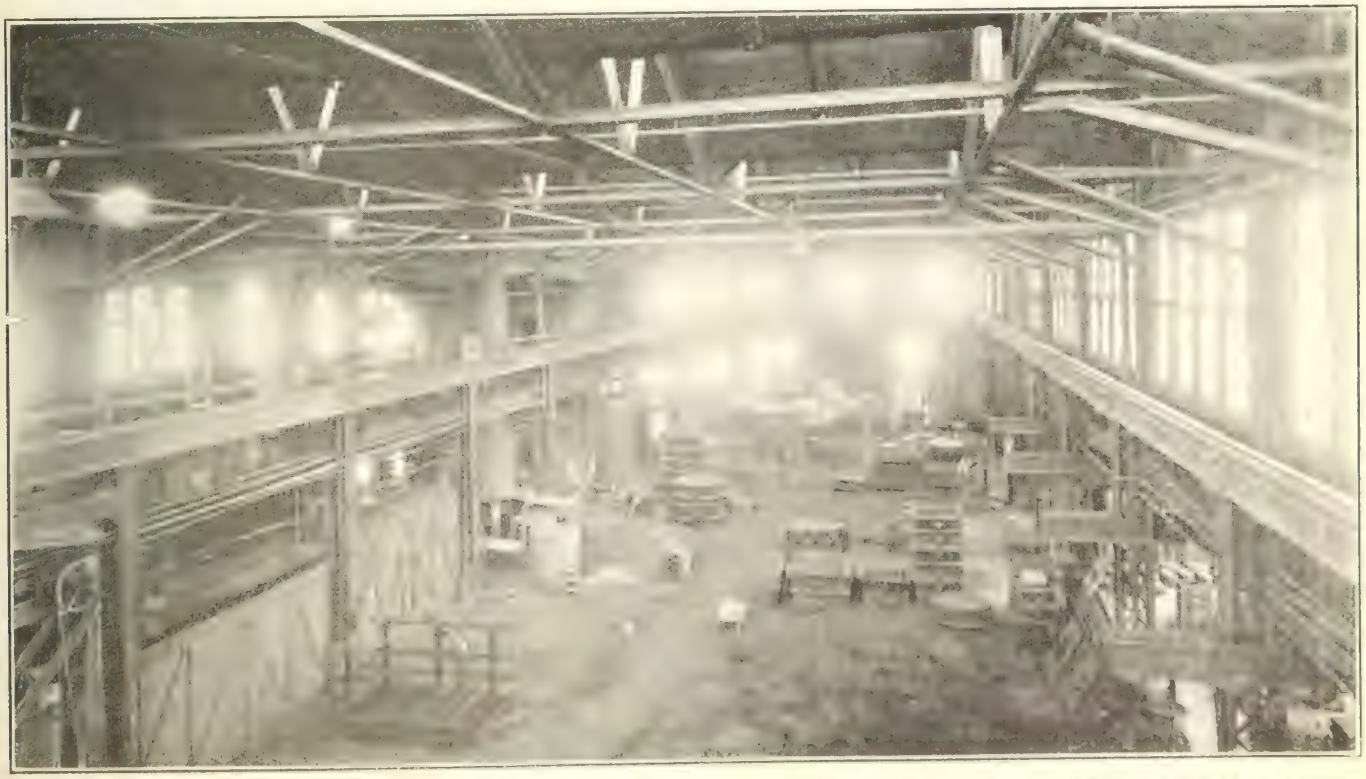
The Canadian Ingersoll-Rand Company, as well as the associated company in the United States, has always been identified closely with the mining industry. In fact the pioneers of the company, Messrs. Rand Sergeant and Ingersoll, each commenced his business by the manufacture of rock drills in New York in 1871. Other mining machinery was added to the output of both companies founded by these men, particular attention being paid to the use of compressed air.

The Canadian enterprise originated in the shops of the Jenckes Machine Company in Sherbrooke, Que. This company had been doing a flourishing machine-shop and foundry business, particularly in connection with the railway construction that was active at that time. During the '80's of the last century the mining industry began to develop rapidly and the Jenckes company arranged with the Rand company of New York to establish in Sherbrooke a factory for the manufacture of mining machinery. This was called the Canadian Rand Drill Company. Rock drills were made in their own little shop, while air compressors were built in the larger Jenckes shops.

Original Companies Merged in 1906

Meantime the Ingersoll Sergeant Co. had established a Canadian branch in Montreal. Their line of mining machinery was made in the shops of the James Cooper Manufacturing Company, under the direction of Mr. Gilman. In 1906 the Ingersoll and Rand companies in the United States were merged, and immediately the Canadian companies followed the same course, Mr. Gilman being put in charge of the combined companies, which position he still holds. Before this amalgamation took place, the original close connection between the Rand and Jenckes plants in Sherbrooke had been broken, so that the Jenckes company took no part in the merger. The new combined company kept the shops of the Rand company in Sherbrooke, which have gradually been expanded to their present important dimensions.

The associated Ingersoll-Rand companies have now seven factories, five of them in the United States and two in Canada. In addition they have agencies and stock-rooms throughout the world wherever the dimensions of the mining industry or other industries using compressed air warrant their attention. In addition there are a number of small assembling and repair shops, as in England and South Africa, for the convenience of those who use their machines.



A view in the foundry, showing the two cupolas and annealing furnaces in the left bay, the casting floor in the centre, and the finishing bay on the right. The raw materials enter by a high-level railway switch to the left, and the products move across the floor, out to the machine shops and into storage, always in the one direction.

Consistent Research Work

The Ingersoll-Rand enterprises were founded upon, and have progressed by means of, industrial research. Their work of investigation began with their first rock drill, long before the term "research" was used; and it continues today, with the aid of the many devices human ingenuity has provided during the last half-century. A visit to the shops in Sherbrooke discloses this practical research work at every turn. Where formerly it was left to the individual initiative of mechanics, foremen or managers, now it is highly organized, not only taking advantage of the ideas and practical skill of men in the shops, but also availing of the services of highly trained designers and mechanical engineers. Thus progress is certain and financial stability is assured.

Research has been required especially since the introduction of the modern high speed, light weight pneumatic tools. These require metals of a grade not dreamed of in former days. The materials of the hammer drill, for instance, must withstand usage that would smash to atoms or pound to a shapeless mass most of the steel used fifteen years ago. This steel is provided by steel manufacturers to specifications made by the machine company, after extended experiments, and then must undergo special treatment in the shops, such as heat treatment, case hardening or annealing, to bring out the special qualities required. Nowhere is a more exact knowledge required of the qualities of alloy steels than in the shops where pneumatic tools, and particularly rock drills, are made.

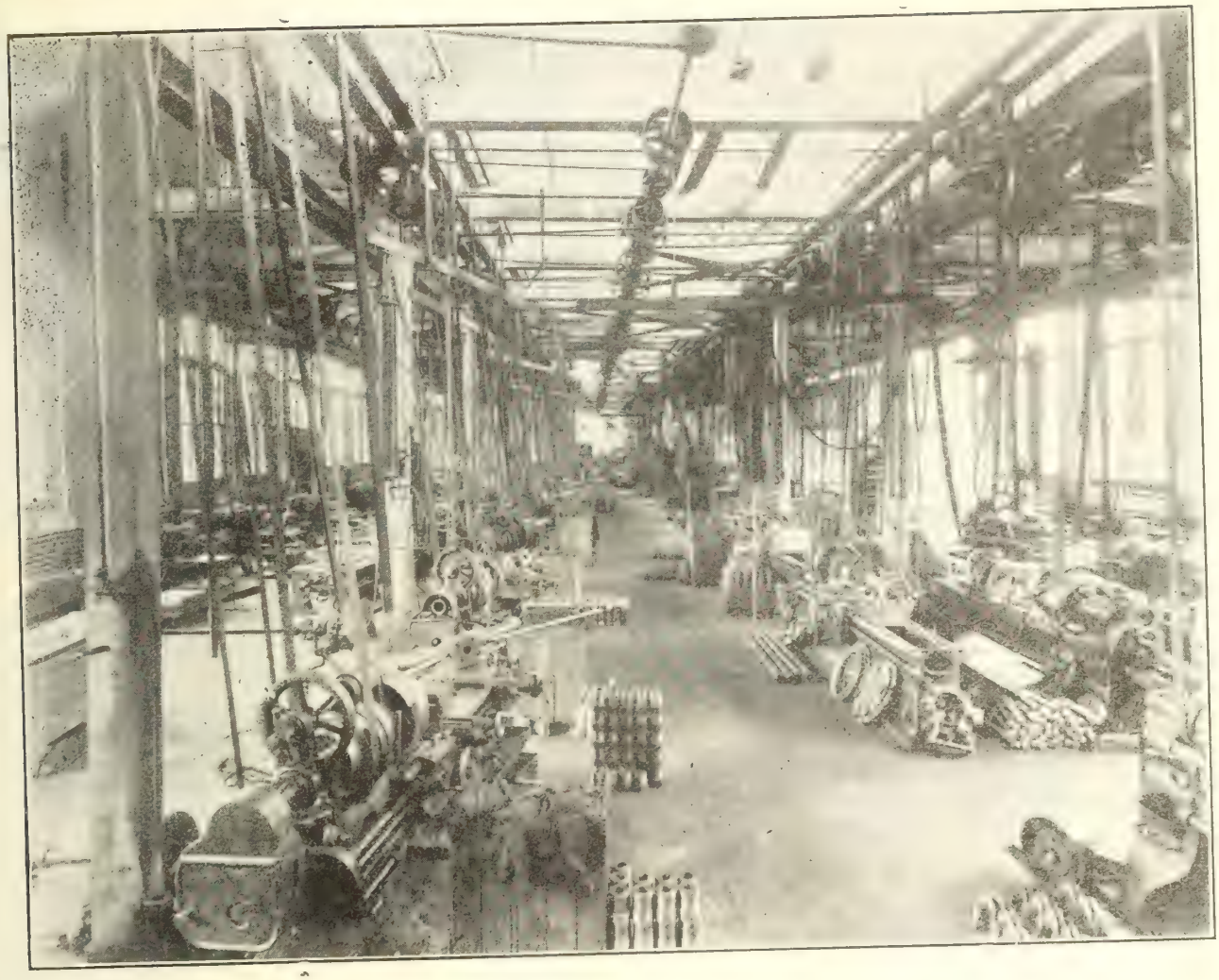
New ideas in design are a most important part of a machinery firm's stock-in-trade. It is gratifying to know that this Canadian company is well aware of the fact and has an adequate and competent staff continuously at work formulating ideas, licking them into shape in the drafting room, building the machines in the shops and then proving or disproving their usefulness by working trials. In this work the firm has the active co-operation of a number of customers, in whose shops or mines some new machine is continuously being tried out in practice.

Though the company has the advantage of a complete *liaison* with the plants in the United States, their practice is not always followed. The smaller Canadian establishment allows of a more rapid change to suit advances in design or improvements in construction.

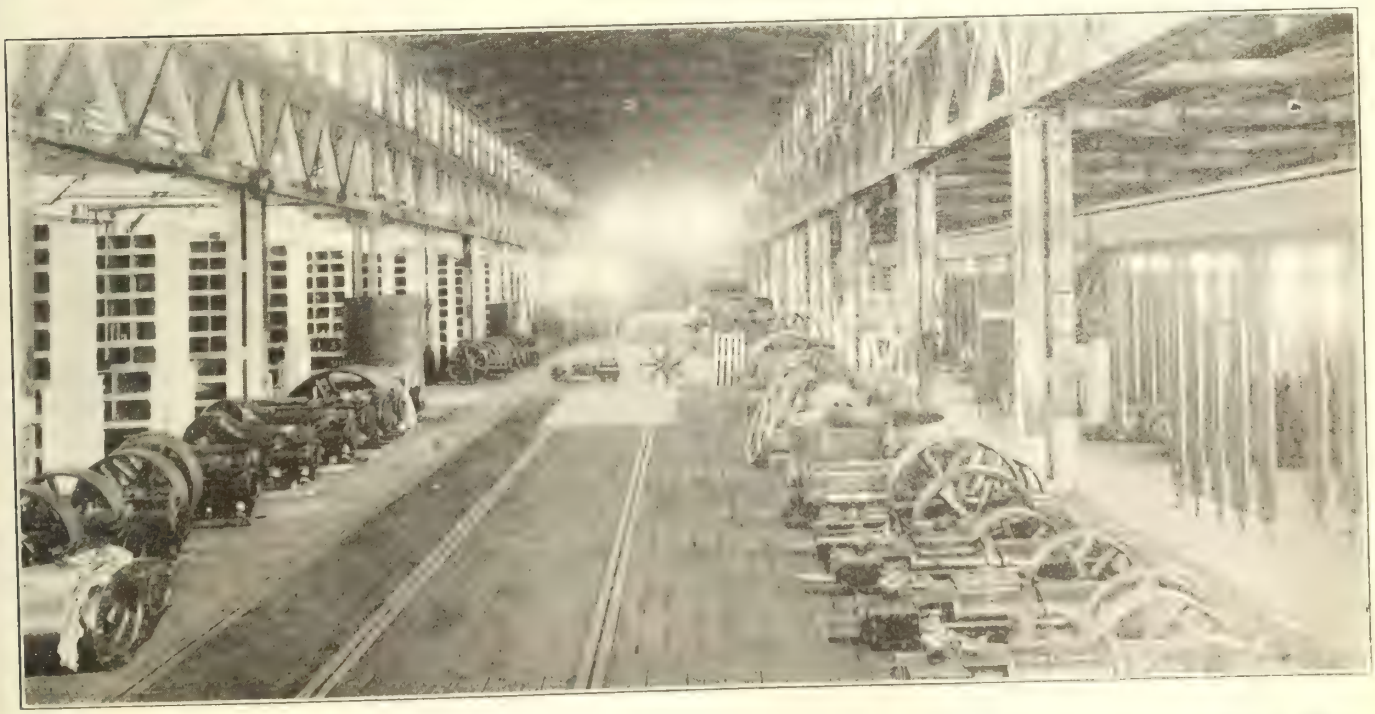
The Sherbrooke Shops

The principal shops of the Canadian Ingersoll-Rand Company are on a site of 23 acres adjacent to Sherbrooke's C. P. R. station. The principal buildings are a foundry, 102 feet by 242 feet; No. 2 shop, where compressors, pumps and hoists are made, 202 feet by 562 feet; No. 3 shop, for the manufacture of coal cutters, Leyner drill sharpeners and the larger types of rock drills; some smaller shops where the smaller hammer drills and pneumatic tools are made; a forge and heat-

No. 2 Shop, where compressors, pumps and hoists are made. This is one of the largest machine shop structures in Canada



No. 3 Shop, in which are made coal cutters, Leyner drill sharpeners and large rock drills



One of the finished store departments at the Rand Plant. A large stock of many of the products is kept on hand for immediate delivery. To the left are shown some of the self-inventoried racks in which are kept spare parts and disassembled small machines.

treatment department; a brick pattern shop, 60 feet by 100 feet, and four pattern storage buildings; and a building 90 feet by 303 feet, formerly No. 1 shop, now used to house the large stock of machines and spare parts that are an integral part of Ingersoll-Rand service.

The factory system used throughout this plant is the system characteristic of this continent. Machines are put through the shops in batches wherever possible, and parts are made exact duplicates of one another, so as to be interchangeable. In fact some of the smaller machines are kept stored piecemeal, in racks, so that complete machines can be assembled at will or, alternatively, they can be used to fill orders for separate parts. The storage system for parts is an ingenious one, providing for automatic and continuous stock-taking, with a result that the stock is seldom either depleted or over-supplied to any appreciable extent. This perpetual inventory has been adopted as a useful device by other firms.

The Jenckes plant, on a separate site on the other side of the town, was taken over during the war time. It is fitted up for making castings, boilers, paper-making machinery and general industrial machinery.

Rock Drills and Coal Cutters

As mentioned above, the original Ingersoll-Rand product was rock drills. The development of the rock drill for fifty years has been largely the result of work by this firm and its coadjutor.

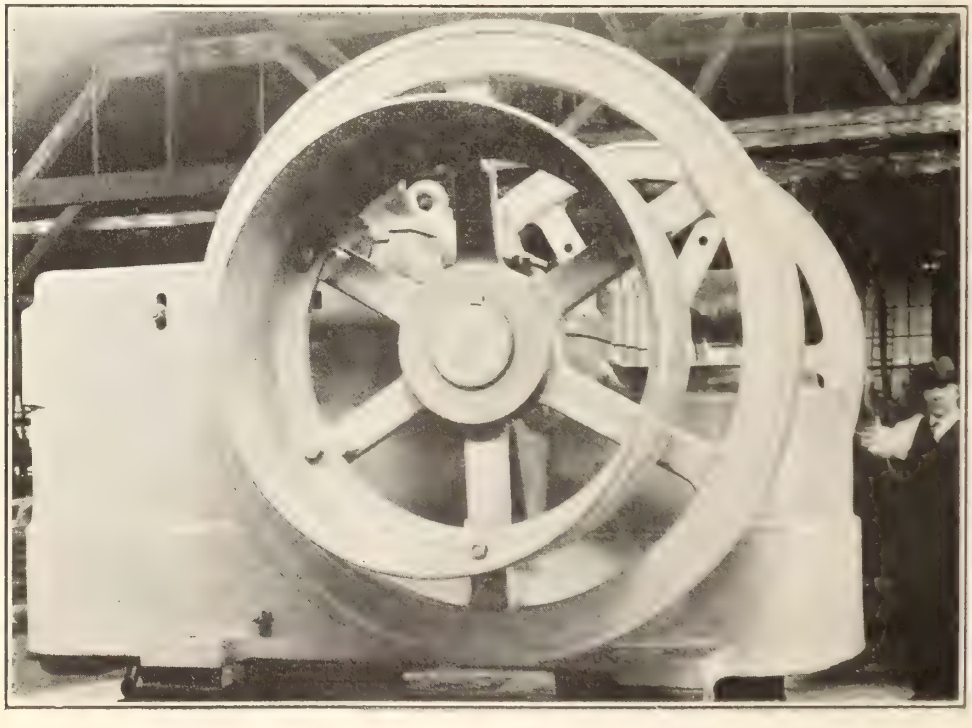
The Canadian shops developed some years ago, and now supply to all quarters of the globe, an outstanding coal mining machine, the "Radialaxe", or coal puncher. A great many of these are used in the collieries of Nova Scotia, and they have been supplied to collieries in most countries with an established coal mining industry.

Testing a hammer drill in a block of Barrie granite for speed and air consumption. This is the last of numerous tests to which all the rock drills are subjected.

Air Compressors

Air compressors are made ranging in size from the huge, high-speed machines built to special order, down to the tiny machine designed to run a single pneumatic tool. An interesting recent development is a portable self-contained unit on wheels or skids, consisting of a gasoline engine and a small compressor designed to supply either one or two full-sized rock drills. Curiously enough, one of the compressors in the plant's modern power house exemplifies the old adage about the shoemaker's children; there is still in use, and likewise in perfect condition, a compressor that was out of date ten years ago. This faithful old servant of the company works alongside larger and more modern types.

A type of air compressor that will appeal particularly to Canadian mine managers is one made for alternative steam and electric drive. This will meet the requirement of numerous mining camps, particularly in Northern Ontario.



A "Circo" jaw crusher, 42" by 36", — one of many built for service in the Quebec asbestos mines.

The Ingersoll-Rand Shop Band. Noon - hour concerts by the "Circo" Band are a feature of the summer months.

Hoists

Hoists are made also in all sizes and for all purposes. During recent years there has been a marked advance in the design of electric hoists. An important new development is now being worked out in the shops at Sherbrooke which will give the electric hoist an even more secure hold on the market.

There are multitudinous other products of these shops, all of them directly connected with or accessory to the use of compressed air. All go to swell the output of a company whose long record gives it a secure place in the annals of Canadian industrial progress, and whose future, based upon faithful service, is found to be in keeping with its past.

BARYTES AND BARIUM PRODUCTS IN 1922

The sales of barytes mined in the United States in 1922 amounted to 155,000 short tons, more than twice as much as in 1921 and about 75 per cent of the average yearly sales for 1916 to 1920. The total value of the domestic barytes sold in 1922 was $1,123,950, an average of $7.25 a ton.

Barytes is a heavy white mineral that enters extensively into modern paint manufacture. An inferior grade of pigments is made from it by grinding it so fine that its powder can be floated on water. A better grade of pigment is made by chemical treatment, and a superior grade by making chemically a mixed zinc and barium pigment.

Missouri continued to lead in the production of barytes in 1922, but Georgia was a close second. More than three-fourths of the total domestic output for the year came from these two States.

The imports of crude barytes in 1922 amounted to 23,239 short tons, valued at $104,680 at the foreign ports of shipment. This is about twice as much as the imports in 1921 but a little less than those of 1920. The barium products industries in the United States consumed 167,842 short tons of ore during the year. From this ore they made 46,176 short tons of ground barytes, 83,360 tons of lithopone, and 13,900 tons of barium chemicals, having a total value of $11,397,832. This is about one and one-half times the quantity of barium products manufactured and sold in 1921, but not so much as was made in 1920. The average annual value of lithopone has decreased from $139.69 a ton for 1920 and $121.45 for 1921 to $110.53 for 1922. Most of the lithopone produced in 1922 was made in Pennsylvania, Delaware, and New Jersey, in the vicinity of Philadelphia, where there are 8 operating lithopone plants or more than half the total number in the country.

OIL SHALE RETORT

At Latrobe, Tasmania, the Southern Cross Motor Fuels, Ltd., have put into operation a retort handling 30 tons a day of shale, from which 50 gallons of oil per ton is recovered. It requires only one man per shift to operate the retort.

CEMENT FROM SPENT SHALE

Experimental work conducted by the Building Research Board in Britain on Scottish oil shale after it has passed through the stills has showed that a hydraulic cement of superior quality can be made from it. The cement when set is of a reddish colour and is harder than Portland cement.

RECONSTRUCTION AT LENS

The shafts and surface equipment of the coal-field at Lens, so thoroughly destroyed during the war, are now well on the way to complete rehabilitation. The huge central power and gas station at Vendin is once more in service, and the temporary head-frames at the collieries are giving place rapidly to the permanent reinforced concrete structures that now are the vogue. The battered mining villages so well known to many Canadian mining men are also patched up or rebuilt, as the case has required, according to recent information.

MANGANESE PROSPECT IN NOVA SCOTIA

Work has been going on steadily at the property of the Aylesford Manganese Mining Company, which is located about three miles south of Auburn, Nova Scotia. The engineer in charge reports that developments to date are quite satisfactory.

The mining of chrome and nickel ores in New Caledonia is reported as improving steadily. The Thio nickel works are running at full capacity.

THE MINING DISTRICTS

By THE JOURNAL'S CORRESPONDENTS

QUEBEC

There has been a general revival of interest this summer in the eastern end of the gold belt in northwestern Quebec, to which Amos on the Canadian National Railway is the chief point of entry. In fact there appears to be about as much activity in this older and more readily accessible part of the gold belt as in the more recently discovered area centred round Rouyn township.

The Duke of Manchester has extensive holdings in this region, and has fifteen or twenty men at work on them. The land is held by a company called the Quebec Gold Rand, Limited, and comprises the following:—

Varsan township — Range 1, lots 1 to 7 (inclusive.)

Varsan township — Range 2, lots 1 to 10 (inclusive.)

Dubuisson township — Range 10, lots 1 to 8 (inclusive.)

Dubuisson township — Range 9, north half of lots 1 to 6 (inclusive.)

Fournier township — 700 acres in the northeast corner.

Malartie township — Range 1, lots 50 to 64 (inclusive.)

Malartie township — Range 2, lots 54 to 64 (inclusive.)

The Union Mines Corporation holds lot 30, range 8, Dubuisson township, and has twelve men at work under the direction of J. C. Yancey, who represents Chicago interests.

On Siscoe Island in Lake de Montigny five men are working.

NORTHERN ONTARIO

Porcupine. — The McIntyre Directors have declared a dividend of 5% payable September 1st to shareholders of record August 1st. The annual report of the company for the year ending June 30th, is not yet available, but the financial statement shows a decided improvement over the preceding year. Gross recovery amounted to $2,250,000, an increase of approximately $313,000. Operating costs were $1,335,000, leaving operating profits of $915,000. Non-operating revenue amounted to $57,000, while taxes for the period were $53,000, leaving net earnings, before depreciation, of $919,000. The company's June output was $247,000, but as the mill was shut down for a short period, due to power interruptions from forest fires, the rate of output was somewhat less than at the present time. Gross recovery is now understood to be approximately $300,000 a month.

The Hollinger has declared the regular four-weekly dividend of 1 per cent, payable August 13th, to shareholders of record July 26th. The company has awarded a contract for the construction of a dam and power house on the company's power lease on the Abitibi River to Sir. Wm. Arrol, Limited, of London, England. This contract involves approximately $1,000,000, but the total cost of the development will be about $3,000,000.

The quarterly statement of the Dome for the three months ending June 30th shows gross profits of $543,880, against which has been charged $138,000 for depreciation and $25,000 for Tax Reserve, leaving $380,280 as net profit. This quarter covers a period, however, during which the output was reduced on account of a shortage of power, and earnings are now running at a much higher rate, the June output being over $420,000. The financial statement shows approximately $4,000,000 of current assets, which includes a Dividend Reserve Fund of $1,041,000, Bonds to the amount of $1,213,000, Call Loans of $750,000, Cash $241,000, Bullion $229,000 and Inventories of $345,000. The cross-cut on the 12th level has penetrated the ore-body recently found by diamond drilling.

A Conciliation Board, consisting of Mr. Balmer Neilly, representing the operators, Mr. Thos. Ryan, representing the miners, and Mr. McG. Quirk, of Montreal, as Chairman, is now sitting in Timmins. The Board will deal with the demand of the men for an increase in wages of 20 cents a hour.

Quinze Power. — The Quinze Power Company has started construction of the steel tower transmission line to Porcupine, and it is hoped to erect from three-quarters of a mile to a mile of line perday. A large number of men are working on the power site on the Quinze River, and in about a month the contractors expect to be pouring cement for the dam. At present over 5,000 h.p. of hydro-electric power is available in Porcupine that is not being used. The Northern Canada Power Company is delivering a total of 17,000 h.p. to the mines.

South Lorrain. — The Mining Corporation, which is operating the Trout Lake property in South Lorrain in conjunction with English financial interests, has attained a depth of over 100 feet in the new shaft At a depth of about 50 feet some silver was encountered. On the company's own properties, including the Frontier, in South Lorrain, the new three-compartment shaft has reached a depth of 550 feet, and two new levels are to be opened up. It is expected that within a couple of months these two new levels will be producing ore. To date very little stoping has been done on the properties, but with the ore obtained from development work and a small amount of stoping on two shoots, the company has derived sufficient revenue practically to pay for the properties and for all the work done, amounting to nearly $750,000. There is a strong probability that the revenue from the South Lorrain properties will enable the company to resume dividend payments in the near future. It is stated that the new Ontario Government proposes extending the Nipissing Central Electric Railway to South Lorrain. If this is done it will permit the Mining Corporation to haul its ore to Cobalt for treatment, and as this company treats customs ores in addition to its own, it would enable any producer in South Lorrain to market any tonnage that

might be available. If such a railway is not built, it is probable that the Cobalt mill would have to be scrapped and a smaller plant built in South Lorrain. This would be an unfortunate event for the Cobalt district, because the Mining Corporation mill is now the only centrally located customs plant to which leasers and small producers can ship.

Gowganda. — The Castle property in Gowganda is obtaining high-grade ore from its lower levels and results on these levels to date are stated to be up to expectations.

Larder. — The Associated Goldfields at Larder Lake claims to have developed about 800 feet of ore of an average grade of $8.00, the width being from 15 to 20 feet. The vein has been opened up on several levels and the greatest amount of work has been done at 375 feet. The company has approximately half a million dollars of cash on hand, which it is expected will be sufficient to carry on further development and build a mill, and no new issue of stock is contemplated at present. The company has about 22,000,000 shares outstanding.

The report of Mr. M. W. Summerhayes on the Argonaut Mine has been published. This report shows estimated ore reserves of 39,000 tons, having an average value of $18.20 a ton, being a total of $710,000. Operating costs, without depreciation, are estimated at $6,80, and the net profit is estimated at $7.00 a ton. This report was written on March 31st, and since that time a good deal of work has been done on the 500-foot level, which has added very materially to the ore reserves. On May 31st the company had cash assets of $92,000, which was expected to be sufficient to carry operations through to the time when they will be on a profit producing basis. The mill is now operating.

Kirkland. — During the first half of July the Teck-Hughes produced approximately $46,000, or at the rate of about $100,000 for the month.

Mr. Ferguson and the Mining Act. — In a recent interview the Hon. Howard Ferguson forecasted some changes in the Mining Act, which it was believed would encourage work on mining properties. It is probable that the present period of five years during which assessment work may be done on claims will be shortened, in order to encourage exploration and development on new properties. He also stated that steps would be taken to prevent the fiasco of a couple of years ago, when a large number of patented properties, including at least one producing mine, were thrown open for restaking on account of the failure to pay the acreage tax. Provision will be made to prevent any sudden forfeiture of patented properties for this cause. It is also believed that the Government has in view the giving of greater publicity to Northern Ontario Mines in United States and England, from where it is expected that considerable capital for development will be derived.

OCHRE IN NOVA SCOTIA

A discovery of excellent ochre (raw sienna) was recently made near Ellerhouse Station on the Dominion Atlantic Railway in Nova Scotia. The color is uniform throughout, with very little gritty matter. The material can be burnt to produce a variety of colors, from reddish brown to black. Prospecting is still going on.

BRITISH COLUMBIA

Developing Portland Canal Properties. — W. R. Wilson, President and General Manager of the Crow's Nest Pass Coal Co., a large shareholder in the Premier Gold Mining Company, a prominent and active member of the Canadian Institute of Mining & Metallurgy, and one who is financially interested in a number of promising mining prospects in different parts of the Province, visited Vancouver and Victoria in July. He was in Vancouver at the time of the visit of the President of the United States and made a short stay in Victoria, chiefly to discuss mining matters with Hon. Wm. Sloan, Minister of Mines. These had to do principally with the opening up by roads and trails of the Portland Canal Mining District where Mr. Wilson's interests extend materially beyond the Premier Mine. He has undertaken responsibilities in connection with the development of the "Big Missouri" Group and it would seem that, as this work proceeds, the enterprise of its promoters is becoming more and more justified. Mr. Wilson has every confidence in this mineralized zone. He looks to see other large producers follow in the wake of the now famous "Premier"; but the nature of the country and the geological pecuniarities, in his judgment, have made it a camp for the man with capital. The miner of small means has in the past and will in the future find it difficult to make satisfactory progress. Large expenditures will have to be made on the properties adjacent to the Premier Group before the mining possibilities of the section will be ascertained and these, it is learned, are to be carried out without loss of time. If, as it is hoped, these demonstrate the continuity of the vein matter at depth, the life of the camp, as one of the important producers of the American continent, will be assured far into the future.

Mr. Wilson's Work at Fernie. — Few appreciate the value of the work Mr. Wilson and his associates are doing for the mining industry of this Province. For many years Mr. Wilson, who has the reputation of being one of the best practical coal mining engineers of Canada, had been engaged almost exclusively in the opening up of the coal measures of the Crow's Nest Pass District. This is a field of wonderful potentialities. Just how many distinct seams of coal there are does not even yet appear to have been definitely established; but it is said that forty-two have been noted. It is the one part of Western Canada where Cretaceous and Tertiary formations have been found outcropping in close proximity to one another. There is enough coal of the best quality to supply the largest and the most exacting market and a substantial part of British Columbia's coal production comes from the Crow's Nest — 554,361 tons of last year's production of 2,580,915 tons — still, mining operations are attended by difficult problems. The friable and gaseous nature of the coal and the tremendous overhead burden on the seams have given Mr. Wilson many anxious moments and have caused him to give of his best effort so to lay out his operations as to ensure the safety of the workers and to provide for a maximum recovery. In dealing with the complexities of the situation he has received, and has accepted in the best spirit, the co-operation and assistance of officials of the Department of Mines. Results of late years

seem to warrant the belief that the best possible methods, having in mind the local conditions, have been evolved and that the field is in shape, when the market and industry warrant, to double, treble, or quadruple its output.

Coal Profits Develop Metal Mines. — Achievement in the coal mining field led to investment, timely and well judged, in metalliferous areas. The outcome of the part taken by Mr. Wilson and his associates, Messrs. Trites and Wood, in the "Premier" now is a matter of history. But the making of a fortune does not enthuse a man of the type of Mr. Wilson as much as the satisfaction that comes of accomplishment. Increased income means added opportunity. Hence he is found re-investing in the Portland Canal District. Nor are he and his associates confining their attention to that section. They have bonded the Windpass coal mine, Chu Chua, near Kamloops, and have options on properties in the newest provincial mining region, the Whitewater. In the opening up of the former they had with them the late General R. G. E. Leckie, who died some weeks ago with tragic suddenness. Since his demise operations have been proceeding and Mr. Wilson states that the results are "very encouraging." To one familiar with Mr. Wilson's characteristic conservation these words mean much more than they usually are accepted as implying.

Fish Creek Mine Changes Hands. — Samuel I. Silverman, on his return from a visit to the Portland Canal Mining District, announced that the Fish Creek Mine, an option on which was obtained by the American Mining & Milling Co. about a year ago, and which is situated on the Alaska side of the Salmon River, has been taken over by London and New York interests. The latter, it is stated, are absorbing the organization to which the property was optioned and will proceed with the development of the Fish Creek holdings. While Mr. Silverman was in the North arrangements were made to commence work on the driving of a 2,500-foot tunnel.

Strike on Bear River. — Excitement has been caused in Stewart by the report of a strike of high-grade ore on the Dunwell Mine, Glacier Creek, Bear River. No. 2 Tunnel, when driven some 280 feet, encountered two veins. In cross-cutting these, ten feet of ore carrying exceptional values in gold, silver and lead were encountered. This property is controlled in Victoria, the Stewart Land Co. being largely interested. The Company's manager confirms the report outlined and is asking that the provincial Government furnish aid for the improvement of transportation facilities in order that development may proceed on a larger scale than heretofore.

Progress in East Kootenay. — A. G. Langley, resident mining engineer at Revelstoke, has returned from a tour of the East Kootenay mining districts. He states that the Kimberley concentrator, Consolidated Mining & Smelting Co., is nearing completion, that it is the last word in modern metallurgical practice and a credit to the engineers and metallurgical staff of the Company and that, with it in operation, the output of lead and zinc in Canada will be largely increased. The Paradise Mine, Windermere, will resume shipments shortly, he states. Bad mountain roads have interfered with the work. Operations are starting on properties on Boulder, Horse Thief and Number Three Creeks. O. C. Thompson will commence the construction shortly of a 100-ton concentrator to treat the ore of the Stemwinder Mine, where there is a large tonnage of ore similar to that of the Sullivan Mine. Mr. Langley also said that Dr. Bancroft, of the Canadian Geological Survey, and party are mapping the Windermere country.

Coast Magnetites Promise Well. — Dr. G. A. Young, who is making a survey of the iron ore deposits of British Columbia with a view to reporting as to the assured tonnage of economic ore available for the support of an iron and steel industry, returned from the field for a few days recently to confer with Dr. Charles Camsell, Deputy Minister of Mines at Ottawa, during the latter's visit to the Coast. Dr. Young is now engaged in an examination of coast magnetite properties. It is understood that the results of the survey so far are very encouraging.

Trail Ore Receipts. — Ore receipts at the Trail Smelter, Consolidated Mining and Smelting Co., for the week July 8 to 14, totalled 9,249 tons. For the first time in many weeks a Rossland Mine figures as a shipper, the Gold Drop having conrtibuted 5 tons The details follow:

	Tons
Alamo, Alamo	48
Company Mines	8,618
Gold Drop, Rossland	5
Lone Pine, Republic Wn.	224
Quilp, Republic Wn.	57
Rosebery-Surprise, New Denver	92
Silversmith , Sandon	43
Standard, Silverton	162
Total	9,249

Cork-Province Shipping Again. — The Cork-Province Mine, it is reported, has shipped its first car of ore to the Trail Smelter, since resuming operations. Two more are ready for hauling, states W. H. Burgess, secretary of the Company, and regular shipments are promised. Mine and mill are working smoothly and for the present zinc concentrate is to be stored.

FUEL EFFICIENCY AT BRICK KILNS

Operators of numerous brick plants are putting into practical application the fuel-efficiency data obtained as the result of the series of burning tests at industrial kilns recently conducted by the laboratory car "Holmes" of the United States Department of the Interior, in co-operation with the heavy clay trade associations, according to reports submitted to the Bureau of Mines by its field agents.

A notable example has been reported to the Bureau from Birmingham, Ala., in the case of an operator of two brick plants near that city who had been operating his kilns without especial regard to modern, efficient methods. This operator, being a member of certain brick trade associations, receives through these associations the results of improved methods of burning as developed by kiln-burning tests conducted under the direction of the Ceramic experiment station of the Bureau of Mines at Columbus, Ohio. Against the advice of the old practical burner and everyone else connected with the work, the superintendent at one of the plants decided to try out the method as outlined by the tests made by the Bureau of Mines. The results were

more than satisfactory. At this plant it formerly took about 9 days to burn a kiln with a consumption of over 1,400 pounds of coal per 1,000 brick. The company had contemplated building more kilns to take care of the demand. They now burn off the kiln in 5 or 6 days and use under 900 pounds of coal per 1,000 brick. Instead of building more kilns, some of the other kilns are now idle, while the plant still maintains its capacity.

THE CONVERSION OF DIAMOND TO GRAPHITE AT HIGH TEMPERATURES

Under this title M. DeKay Thompson and P. K. Frolich gave in a paper before the American Electrochemical Society in New York, May 3-5, an account of experiments made to determine the temperature at which the change of diamond to graphite begins to show. It has long been known that this change takes place at the temperatures of electric arcs and electric furnaces, but contradictory statements have been made as the temperature at which diamond ceases to be stable. The authors, using a small Arsen furnace fitted with appliances for securing constant temperatures, found that diamonds change slowly to graphite at 1650 deg. C. and at 100 degrees higher the change takes place 26 times as fast.

POSITION WANTED — A Canadian Mining Engineer, graduate of Canadian University, specialized in the geology, development and operation of iron mines on a large scale in the Western States, desires to return to Canada to follow up the iron industry. Can give best references. Apply Box 602, Canadian Mining Journal, Gardenvale, Que.

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Ontario's Minerals

PROVINCE OF ONTARIO

Hon. H. Mills, Minister. DEPARTMENT OF MINES *Thos. W. Gibson, Deputy Minister*

Hon. CHAS. McCREA, Minister

Mineral Areas

Ontario, with its 407,262 square miles, contains many millions of acres in which the geological formations are favourable for the occurrence of minerals 70 per cent of the area being underlain by rocks of pre-Cambrian age. The phenomenally rich silver mines of Cobalt occur in these rocks; so also do the far famed nickel-copper deposits of Sudbury, the gold of Porcupine and Kirkland Lake, and the iron ore of Magpie and Moose Mountain mines.

Economic Minerals

In addition to the above, practically all economic minerals (coal and tin excepted) are found in Ontario: — actinolite, apatite, arsenic, asbestos, cobalt, corundum, feldspar, fluorspar, graphite, gypsum, iron pyrites, lead, mica, molybdenite, natural gas, palladium, petroleum, platinum, quartz, salt, talc and zinc. This Province has the largest deposits on the continent of talc, feldspar, mica and graphite.

Building materials, such as ornamental marble, limestone, sandstone, granite, trap, sand and gravel, lime, Portland cement, brick and tile, meet every demand.

Mineral Production

Preliminary returns show the output of the mines and metallurgical works of the Province for the year 1922 to be worth $62,202,169, of which the metallic production was $38,190,711.

The following figures show the growth of Ontario's mineral industry by five-year periods since 1891 when a Bureau of Mines was first established.

Year.	Value.	Year.	Value.
1891	$4,705,672	1911	41,976,797
1896	5,235,003	1916	65,303,822
1901	11,831,086	1918 (Maximum war output)	80,308,972
1906	$22,388,383	1921	48,128,387
	Dividends.		

Dividends and bonuses paid to the end of 1922 amounted to $28,096,699 for gold mining companies, and $86,238,185 for silver mining companies or a total of $114,334,884.

Mining Regulations

A miner's license costs $5.00 per annum, and entitles the holder to stake out in any or every mining division three claims of 40 acres each. After performing 200 days' assessment work on a claim, patent may be obtained from the Crown on payment of $2.50 or $3.00 per acre, depending on location in unsurveyed or surveyed territory.

Assay Office

The Provincial Assays Office at No. 5 Queen's Park, Toronto, is maintained by the Department of Mines for the free identification of minerals, free assays under the provisions of the Mining Act of Ontario, and also for general assay work as per the Schedule of Charges which may be obtained on application.

Temiskaming Testing Laboratories

The Department maintains, at Cobalt, an ore sampling and testing laboratory which is now prepared to receive parcels of gold ore from 100 pounds upward, and after sampling and assaying the same to pay to the shipper the value thereof, less treatment charges. The purpose is to afford a market for ores extracted by prospectors and others in developing their mining claims, enabling them to obtain funds which they can use for further work and to report on the most satisfactory method of treatment. Fuller information may be obtained on application to the Manager, Temiskaming Testing Laboratories, Cobalt, Ontario.

Publications

For list of publications, illustrated reports, geological maps and mining laws, apply to

Thos. W. Gibson,
Deputy Minister of Mines,
TORONTO, CANADA

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Denver Rock Drill Mfg. Co.
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Canadian Ingersoll-Rand Co., Ltd.
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Peacock Brothers, Limited.
Smart-Turner Machine Co.

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The William Kennedy & Sons, Ltd

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Denver Rock Drill Mfg. Co., Ltd.
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Hendrick Mfg. Co.

Screens — Revolving:
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Hendrick Mfg. Co.
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Sewer Pipes:
Wettlaufer Bros.

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Peacock Brothers, Ltd.
The William Kennedy & Sons, Ltd.

Ship Loaders: see Conveyors
Canadian Mead-Morrison Co.

Silent Chain: See Chain Drives
Silent & Steel Roller—See Roller Silent Steel.

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Sintering:
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Smelters:
Goldsmith Bros.

Smoke Stacks:
Can. Chicago Bridge & Iron Co., Ltd.
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Hull Iron & Steel Foundries.

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Sullivan Machinery Co.

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The William Kennedy & Sons, Ltd.

Sulphate of Copper:
The Mond Nickel Co., Ltd.

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Gutta Percha & Rubber, Ltd.
Hadfields, Ltd.

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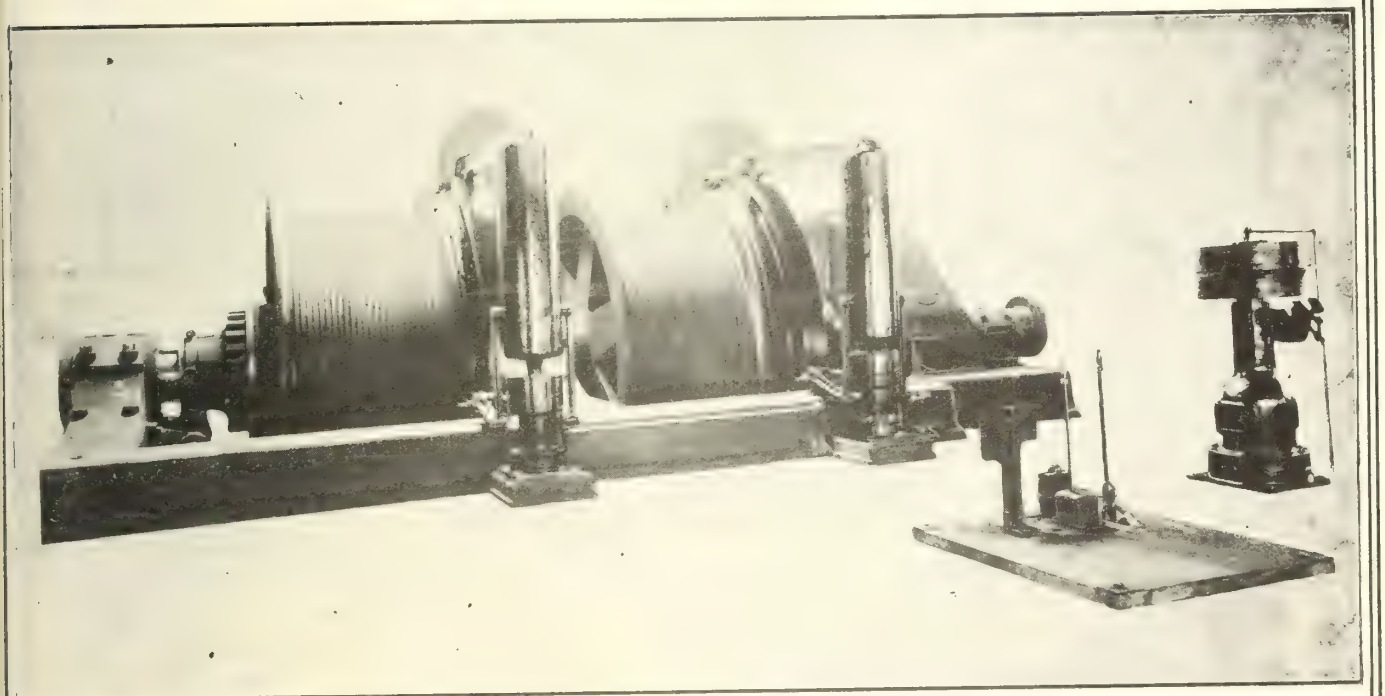

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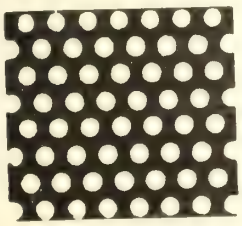

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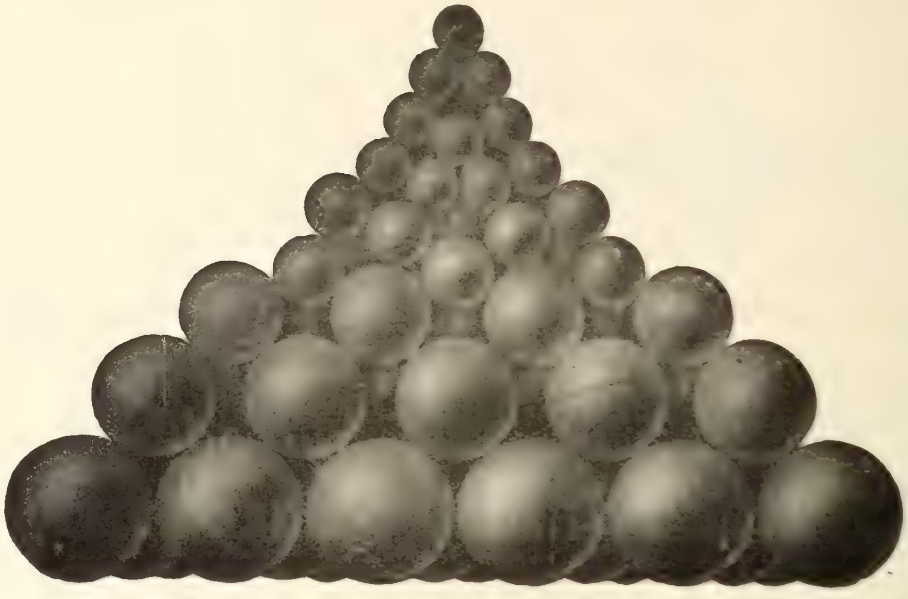

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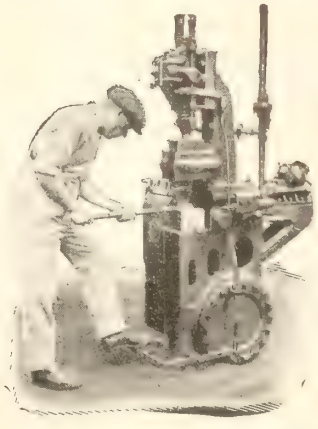

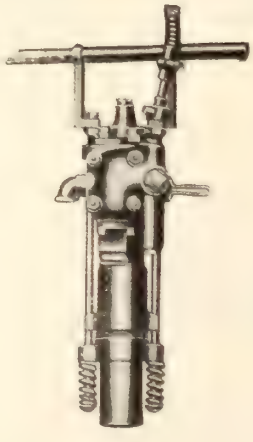

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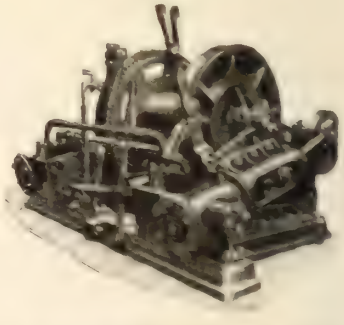

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:-: EDITORIAL :-:

OUR CONTRIBUTORS

The Canadian Mining Journal welcomes to Canada the members of the American Institute of Mining and Metallurgical Engineers who will gather in Toronto next week for their summer excursion. In order to make this welcome tangible, it has enlisted the aid of a number of men prominent in the mining and metallurgical circles of Ontario and Quebec in preparing a series of articles describing the mining camps to be visited. We shall not try to steal their thunder, (a habit imputed to all editors), but shall merely mention them in sequence.

On these editorial pages Hon. Charles McCrea, newly appointed Minister of Mines for Ontario, and Hon. J. E. Perrault, Minister of Mines for Quebec, join us in welcoming our American guests.

After a short (and select) history of certain notabilities to be encountered on the trip, we present a general description of Ontario's mining industry by Mr. Thos. W. Gibson, who has guided its destinies with unwavering hand for longer than we can remember. We have made capital of the good nature and public spirit of a number of the members of his staff; Dr. Miller summarizes the geological features of the North country; Mr. T. E. Godson gives the main features of the Mining Act, and Mr. T. F. Sutherland describes the mines inspection system, for whose administration he is responsible, and then tells what a fine place Ontario is for the miner.

Sudbury is the first camp to be visited. Mr. Alexander Gray, now of Montreal and formerly of Colorado, Australia, the Rand and London, gives the record of this famous camp, and Mr. Sutherland touches on its history.

The next stop is at Cobalt. Dr. J. Mackintosh Bell has prepared a study of this and the adjoining silver areas that will stimulate thought and should stimulate discussion. Our Northern Ontario correspondent gives a resumé of Cobalt's history and record of production, as well as that of the gold district to the north.

Kirkland Lake and Porcupine are still in the making. Mr. Balmer Neilly, secretary of the Ontario Mining Association, describes these briefly, with an eye to their future. Professor George J. MacKay, of Queen's University, compares Ontario gold metallurgy with that of the Rand, where he spent a number of years employed in the mills. Mr. A. G. Burrows, who has followed the progress of the Porcupine camp from its discovery and is now engaged in a re-examination of the field for the Ontario Department of Mines, describes its geological features.

Quebec's mining industry is characterised by Mr. John E. Dresser, President of the Canadian Institute of Mining and Metallurgy, whose acquaintance with it has been long and intimate. Mr. A. O. Dufresne, the active Assistant Superintendent of Mines for Quebec, describes the new Rouyn gold field in the north-western part of the province, whose development will, it is hoped, do much to stimulate the search for minerals throughout Quebec's vast, unexplored hinterland.

The asbestos district of the Eastern Townships is the last camp on the tour. Mr. Norman R. Fisher has prepared a description of it that will effectively guide the excursionists through the pits and the mills.

This issue of the *Journal* demonstrates clearly the fact often repeated by editors and seldom realized adequately by others, that technical journalism is a coöperative venture in which the technical men of the profession are jointly responsible with the publishers. We thank our contributors in this instance, many of them busy men who can scarcely afford the time to write, for having made an addition, not only to the technical literature of their country, but also to the success of our visitors' summer excursion.

THE ITINERARY

This issue of the *Journal* is designed as a guide to the mining camps to be visited by those attending the summer excursion of the American Institute of Mining and Metallurgical Engineers during the next two weeks. Gathering in Toronto on August 20th, the excursionists will inspect the mines, smelters and mills at Sudbury, Cobalt and South Lorrain, Kirkland Lake, Porcupine, and the Thetford district. They will go from Porcupine to Quebec via Cochrane and the Canadian National Railway, and after a day in Canada's oldest city will proceed to Montreal, via Thetford. In Montreal technical sessions will be held on the 30th and 31st of August.

Committees of mining men and geologists have prepared programmes for the visitors at the various Canadian centres. The actual visits to the numerous places of interest will be the most important and the most attractive feature of the excursion, of course, and the printed page will no doubt prove to be an aid in the tour of inspection. In the August issue of *Mining and*

Metallurgy, the official publication of the American Institute, there are three papers specially prepared for the purposes of this excursion, viz: "Notes on the Mining Industry in Canada," by Edward K. Judd; "Kirkland Lake Gold Area," by Percy E. Hopkins, of the Ontario Bureau of Mines; and "Notes on the History of Porcupine," by L. D. Huntoon.

WELCOME TO THE PROVINCE OF QUEBEC!

To the President and Members of the American Institute of Mining and Metallurgical Engineers.

Gentlemen:—

As official head of the Department of Mines of the Province of Quebec, it becomes my pleasing duty to extend on its behalf, through the columns of the *Canadian Mining Journal,* a very cordial greeting and the warmest possible welcome to the members of your excursion party, upon the occasion of their approaching visit to our Province.

You come to us after visiting the silver mines of Cobalt and the gold mines of Porcupine, which not only adjoin the Quebec boundary, but whose mineral bearing formation extends for miles into our Province, and where already 1,200 claims have been staked in Rouyn Township alone, placing over 200,000 acres under permit. You will thus see, in virgin condition, the future site of the most promising gold fields of the immediate future; while at Thetford and Black Lake in the Eastern Townships you will be in the heart of the greatest asbestos mines of the world, whose wonderful yield is a remarkable testimony not only to the richness of the mineral deposits, but also to the liberal mining laws of our Province, which are framed with a view to the encouragement of prospecting and production, and which offer absolute security of title to the successful prospector and operator.

Hoping that you will one and all enjoy your visit to our Province and will find here much in our mineral deposits and liberal mining laws to commend them to your favourable consideration and warm recommendation,

I have the honour to be,

Yours very sincerely,

(Signed) J. E. PERRAULT,

Minister of Mines.

Quebec, August 10th, 1923.

MESSAGE FROM ONTARIO'S MINISTER OF MINES

To the Members of the American Institute of Mining and Metallurgical Engineers:

I bid you welcome to our far-flung Empire of the North, whose mineral riches you have come to see.

You will find at Sudbury the largest and most productive source of the world's supply of nickel; at Cobalt a silver camp whose mines, after twenty years' operation, are still producing freely, and where recent discoveries rival in richness the finds that electrified the world in 1903, 1904 and 1905; at Porcupine a group of gold mines of the first rank, one of them yielding a million dollars' worth of gold per month; and at Kirkland Lake half a dozen deposits producing bullion. Moreover you will find other Porcupines and Kirklake Lakes in the making.

Ontario is in a unique position as regards gold production; while in every other country it is declining, here it is increasing. A significant fact is that our gold ores are not confined to one or two isolated patches, but are found over a wide stretch of country extending for hundreds of miles. The great pre-Cambrian shield of Northern Ontario, much of it yet untrodden, provides one of the best remaining areas in the world for the searcher after gold and silver.

Here is an inviting field also for engineering skill and capital. Our laws do not discriminate between citizens of the United States and British subjects, or between American capital and British capital.

The mining regulations are liberal. Our institutions are not a passing phase; they are stable. Our system of mine taxation is based on net profits, and the welfare of the mining industry forbids hasty or ill-considered attempts at change.

Beneath the summer sky of our northern clime you are almost certain to be favoured with good weather. I sincerely hope you will enjoy your visit to the full, and I believe that in returning from the land of the Union Jack to that of the Stars and Stripes, you will do so feeling as did the Queen of Sheba, that the half had not been told.

C. McCREA.

Minister of Mines.

Toronto, August 11th, 1923.

WELCOME THE A. I. M. M. E.

From yon Republic, strong, and wide, and free,
The very home of human liberty,—
Where reigns without a mitigant condition
The most uncompromising prohibition,—
We welcome you as leaders, wide of brow,
Whose mission is to show us why and how.
Ambassadors of Progress, we embrace ye!
We know that virtue and true knowledge grace ye.
That erudition is your middle name,
And your repute a synonym for fame.
Whether in Montreal or South Lorrain,
Whether on steamer or aboard the train,
We ask you to consider all your own,
To make your needs of any nature known.
(A hint, a word, the thoughtful host suffices,—
Folk cannot live on soda or on ices.)

J. C. M.

Peripatetic Personalia

"The proper study of mankind is *man*."

Alexander Pope said a mouthful when he wrote that ine! We agree with him so heartily that, for the benfit of our visitors, members of the American Institution of Mining and Metallurgical Engineers, we have ompiled a short descriptive catalogue of a few outtanding Canadian mining men. Our sins of commission are glaringly apparent hereunder. Not so our ins of omission: for such a contracted list embraces nly types. Dozens, scores, nay, hundreds, of notbilities have necessarily been excluded. A complete "Who's Who" would be an appalling tome. Regard vhat follows, therefore, as a "Who's What" — a ualitative, rather than a quantitative, effort.

We have grouped our exhibits geographically, without any regard to precedence or seniority.

TORONTO

Dr. W. G. Miller—

"That leader of the rocky clan, respected Willett Miller,
"Who won his name and fame withal by diagnosing siller."

This doggerel very inadequately indicates Dr. Miller's claim to fame. It is true that, professionally, he stood *in loco parentis* to Cobalt. But his name and fame, and his place in the affections of Canadian mining men, had been won whilst Cobalt was still Long Lake. Canadian geology owes much to Dr. Miller. Those who owe him nothing at all are such of his fellow-geologists as have "started sumpin'" in the way of an argument with him. A synthetic Miller would result from some such recipe as this:—

Take—210 pounds best Scottish-Canadian brawn:
Stir in — a flair for handling men and affairs:
Season with discretion and the slyest sense of humour obtainable: and — garnish with an irresistible smile.

J. B. Tyrrell—

"A man who knows each rock and squirrel
"Throughout the North, is J. B. Tyrrell."

Or if he doesn't, he should. Tyrrell, though not notably averse from the fierce light that beats upon the known, is a plain, blunt man who can eat prunes and goo with anybody. Shakespeare notwithstanding, his honours have been in part achieved and in part thrust upon him.

Frank C. Loring—

"A primrose by the river's brim
"A yellow primrose is to him,—
"And infinitely more."

The shade of Wordsworth may resent this, but Mr. Loring will not, when we add that he is an old-time honest-to-goodness miner: a man who has seen many a boom rise and bust and who has survived honorably the vicissitudes and mutations of Canadian metal mining. Loring might have been an artist, hence the prefatory profanation of the poet. He seeks not the limelight.

T. W. Gibson—

"That man was famous and was had
"In es-ti-ma-ti-on
"According as he lifted up
"His axe thick trees upon."
(Covenanters' Psalm.)

The sturdiness of Mr. Gibson's moral fibre is attested by the fact that he has administered the affairs of the Ontario Department of Mines for Lord knows how long, without noise or blather. Notwithstanding Mr. Gibson's calm restraint, we should rather guess that he would have been a holy terror swapping buffets with obsidian weapons in the Neolithic Age.

H. E. T. Haultain—

"Like the war-horse he sniffeth the battle afar;
"He champs at his bit, and he hankers for war."

Which means simply that Professor Haultain, who occupies the Chair of Mining at the University of Toronto, is guaranteed not to go out of his way to avoid a row. Haultain, beloved of his students, is devoted to them and to comminutive curves and abrasive abstractions. Though a high explosive, he is not smokeless.

G. R. Mickle—

"Assessor Mickle, saturnine, severe,
"But damnably precise, correct, and clear!"

Mr. Mickle's ungrateful task is to assess for the Ontario Government the taxability of mining companies. He does his duty unflinchingly, but not provocatively. Indeed he is a round peg in a circular hole.

Balmer Neilly—

"Show me a calm man, I'll show you one calmer;
"Show me Gilead's balm, and I'll show you Balmer."

When the Ontario Mining Association (a protective body) was formed, Balmer Neilly, himself an operator of no mean repute, was selected as the Association's inside guard, flying wing, glad-hand artist, and strategist. It is not to be doubted that he was instructed to counteract the Provincial Assessor's nefarious activities. He has won his spurs, but he has never used them on the Assessor.

Dr. J. Mackintosh Bell—

"Suaviter in modo, et fortiter in re."

Dr. Bell is the Canadian representative of goodly Old Country interests. He is a shining example of the mining engineer as an administrator of large business. He is the official connecting link between the sedate Institution of Mining and Metallurgy (London) and the Canadian body of the same ilk. Mackintosh Bell has a skeleton in closet — as all normal beings have. He runs to literature in his leisure. However, he has few spare moments.

T. F. Sutherland—

"Stern Instrument of Law, thou and thy minions
"Regardless are of other folks' opinions."

Since Chief Inspector of Mines Thomas F. Sutherland is of old Presbyterian stock, he must be a Calvinist. We may thus assume that he is a fatalist. In any case he deals with fatalities. Thomas is Didymus when it comes to alibis — Aquinas when dealing with subterfuges. He is not at his best on formal occasions. He can detect a joke.

Hon. Charles McCrea—

"And our eyes on all his motions
"With a mute observance hang."

The Hon. Mr. McCrea, not yet put to the proof, will, we hope, keep his ear to the ground and his eye on these columns during his tenure of the office of Minister of Mines for the Province of Ontario.

COBALT

Arthur A. Cole—

"To get some concept of the North, the whole
"Far-stretching North, confer with Arthur Cole:
"Take him as guide, philosopher, and friend,—
"A man of information without end."

Mr .A. A. Cole, Mining Engineer to the Temiskaming and Northern Ontario Railway Commission, is more than a mere person,—he is an institution, a thesaurus. He worships at the shrine of Arcturus. The North is his mistress, a mistress coldly chaste and imperious.

James Denny—

"For problems touching chemistry, or any
"Discussion of refining, go to Denny."

When a painfully respectable University goes out of its way to create a new kind of degree wherewith to decorate a man, then it's going some. Mr. Denny has been so decorated. He is the Nipissing's metallurgist. The good Lord endowed him with brains and modesty in equal parts. His modesty is remarkable.

M. F. Fairlie—

"The Grace of God it worketh woundily,—
"Didna I mine, 'twad be the Kirk for me!"

A prepossessing young man, with an engaging smile, is Mr. Fairlie. The Mining Corporation entrusts him with a large part of its affairs.

Cyril W. Knight—

"Ah, Love could you and I with Him conspire
"To grasp this sorry scheme of things entire—"

At least Mr. Knight, formerly Dr. Miller's assistant, now absorbed by Nipissing, would be able to supply most of the inside dope about the interior geological economy of Cobalt.

PORCUPINE

Richard Ennis—

"Smile and the world smiles with you."

The General Manager of the McIntyre has not always lain on a bed of roses. Without danger of fracturing the eternal verities, Mr. Ennis may be denominated a good sport. Naturally he is not deficient in administrative acumen.

A. F. Brigham—

"A hell of a job old Atlas had!
"But he had nothing on me, begad!"

To manhandle the Hollinger is no child's play. Although Mr. Brigham sometimes makes a noise like a weary Titan, he looks awfully well in golf "pants."

H. DePencier—

"Lo, in the middle of the wood,
"The folded leaf is wooed from out the bud."

Mr. DePencier is the General Manager of the Dome. Mr. DePencier's genius for administrative detail has been developed gradually and soundly. We, who write this, have watched his growth in grace with admiration.

MONTREAL

John A. Dresser—

"Twinkle, twinkle, Prester John!
"What's the jape you're bent upon?"

Mr. Dresser, it need hardly be stated, is President of the Canadian Institute of Mining and Metallurgy. A quondam professor, he is now a self-respecting mining geologist. He knows his work, and he knows human nature. This latter has taught him wide tolerances.

G. C. MacKenzie:—

"A cubit more, a cubit less,
"A stone or two of lean or fat.
"What matters it when all is said?
"A man's a man for a' that!"

The assiduous Secretary of the C. I. M. M. has borne patiently through life an irritatingly disrespectful nickname. Far be it from us to give it further currency. We merely rise to remark that any secretary of any Canadian technical society deserves the prayers of the congregation. "Spike's a good fellow, and 'twill all be well."

W. M. Goodwin—

"This wretched world is wrong, O, cursed spite!
"That I was ever born to set it right!"

This miserable paraphrase of the poet's noble lines is no more excusable than the mayhem that the Editor of the *Canadian Mining Journal* often commits on our manuscript. The young man who sets out to make this world better has our sympathy, but never our co-operation. Anyway, one cannot argue with an editor. If you get the better of him he won't publish your letter. The sad part of it is that Mr. Goodwin was once a God-fearing prospector.

Alexander Gray—

"Sir Oracle, I pray you, can you tell
"Precisely the formation down in Hell?"

In the proper person of Mr. Gray, free-lance and journalist at large, are combined two antithetical entities, the wise man and the wise guy.

Sir Stopford Brunton—

"If anyone can show you how to harrow net
"Profits from out a mine, it is the Baronet."

Though the exigencies of rhyme seem to have left no alternative, the sentiment expressed is, we doubt not, perfectly true. Sir Stopford is manfully living down his titular superfluity. A man can't do more than that.

John E. Hardman—

"John Hardman, O, my jo John,
"When we were first acquent
"You step was firm—'tis yet John:
"'Tis Time, not you, has bent!"

Mr. Hardman is one of the fathers of the C. I. M. M. His long attrition with his fellows has given him a polish that lies deeper than varnish. He is the post-prandial Chauncey Depew of the Institute.

SUDBURY

C. V. Corless—

"O, Elder Statesman, furrowed as to brow!
"Come off the roof, and join our party now!"

Dr. C. V. Corless is a scholarly, detached, much-appreciated citizen. He pilots the Mond Nickel Company through smooth and broken water. A former President of the C. I. M. M., his pronouncements carry weight with everybody save only a recalcitrant Scot whose name is Campbell.

OTTAWA

Charles Camsell—

"No thought of self, and no ambition sinister,
"Contaminates the Deputy of a Minister."

A long apprenticeship as a mining geologist, explorer, and so on, fitted Dr. Camsell to hold down the job of Federal Deputy Minister of Mines. A Deputy Minister cannot afford indiscretions of his own: he has to explain those of the Minister. He thanks High Heaven when the Minister realizes the depth of his own innocence of mining.

* * *

Editor's Postscript—

We ask the indulgence of our readers for the material published above. As a psycho-pathological phenomenon it may be of interest. Otherwise our only excuse for its appearance is the fact that it crept into the "forme" during our absence.

The Mining Industry of Ontario

By THOS. W. GIBSON*

Introductory

In Holy Writ, Canaan of old was pictured to the expectant Israelites as "a land whose stones are iron and out of whose hills thou mayest dig brass." A modern writer would hardly feel justified in using language so quaint, yet the underlying idea was sound. A land rich in mineral resources can justly lay claim to the possibilities of material greatness.

Canada as a whole is beyond doubt a rich mineral country, but it is rather striking how varied are the contributions to the common wealth made by the several provinces. On the eastern and western coasts, and in the Rocky mountains, are vast supplies of coal, which is entirely wanting in the central provinces of Quebec and Ontario. Quebec, Ontario and British Columbia yield copper, but on the western plains, save in Northern Manitoba, this metal is practically unknown. Silver is confined to Ontario and British Columbia, and as regards commercial production, the same may be said of gold. Nickel comes only from Ontario, and asbestos only from Quebec. Mineral deposits naturally have no relation to boundary lines; the key to their location is in the geological structure.

In the northern half of North America it is now recognized that the formations laid down and piled up in pre Cambrian times are *par excellence* the metal-bearing rocks of the region. By the same token, having been formed before vegetable or animal life appeared, the pre-Cambrian formations contain no deposits of coal. But of iron, copper, gold and silver there is abundance.

Iron Ore

Confining one's self to Ontario, it is undoubtedly true that her deposits of iron ore are very large. In many parts of Northern and Northwestern Ontario are found iron ranges of unusual dimensions. Unfortunately, they are in the main highly siliceous and low in iron. This is true both as regards magnetite and hematite, not to speak of siderite, though the deposits are largely of the first named variety. In the present state of the iron smelting industry, these ore-bodies are mainly to be regarded as a reserve against the time when progress in the art of reducing iron ore to the metallic form will permit of their utilization, or on the other hand until it has been shown that magnetic or other forms of beneficiation are commercially practicable. Advances in the latter direction undoubtedly are being made, and recent experiments with briquettes produced at Moose Mountain charged into the furnace along with good natural ore have given a product of high quality. Meantime, the blast furnaces of Ontario are forced to import from the United States practically all the iron ore they require, which is in the neighbourhood of one and a half million tons per annum.

Silver

In silver, Ontario has far surpassed in production all her sister provinces. The first good deposit was on Silver Islet, a small island on the north shore of Lake Superior, where in 1868 Thomas Macfarlane found a rich vein containing native silver. On being developed the ore was found to carry nickel, cobalt, arsenic and bismuth. The deposit closely resembled those found at Cobalt 35 years later. About three and a half million dollars' worth of silver was taken from the Silver Islet mine from first to last. The metal was also found on the mainland of Lake Superior, and several mines were opened up and a considerable quantity of silver obtained.

Consistent silver mining in Ontario began, however, with the discovery of phenomenally rich ore-bodies in 1903 near Long Lake (afterwards re-named Cobalt lake) during the construction period of the Timiskaming and Northern Ontario Railway. The richness of some of the ore was surprising, running up to and beyond 10,000 ounces of silver per ton. The veins were found mainly in conglomerate rock, but also in diabase and Keewatin. The key to the origin of the ore-bodies, as was soon determined by the Government geologists, was an intrusion of diabase that shattered and fissured the conglomerate and Keewatin and at or about the same time deposited silver in these veins or cracks. Production began in 1904, and up to the end of 1922, about 332 million fine ounces of silver have been recovered.

The veins are narrow, varying from half an inch to eight or ten inches in width, and are limited both in length and depth. Other constituents of the ore are cobalt, nickel and arsenic, all of which are recovered in refining the ores. These deposits have placed Ontario in a leading position so far as supplying the wants of the world with cobalt is concerned.

In the original Cobalt area, contiguous to the town of that name, the high-grade ores have for the most part been pretty well worked out, and the mines are now largely operating on low-grade ore. By using the flota-

* Deputy Minister of Mines, Toronto.

tion process it has been found profitable to treat wall rock containing as low as eight or nine ounces per ton, and also old dumps previously regarded as worthless. By this means, and also by an occasional discovery of rich veins not coming to the surface, or which had previously escaped notice, the life of the camp has been prolonged. Recently, developments at the Keeley and Frontier mines in South Lorrain, a subsidiary camp lying twelve or thirteen miles to the southeast and on the shore of Lake Timiskaming, have greatly helped in maintaining the district's silver mining industry.

The Keeley mine was deemed worked out many years ago. Its supposed failure brought the Farmers' Bank to grief and put its president in jail. In realizing the bank's assets, the mine was sold for a small sum and passed into the hands of an English company. The Company's manager, J. Mackintosh Bell, correctly interpreted the geology of the deposits, and persuaded his company to sink to a greater depth. They did so, and struck a large quantity of ore of extraordinary quality. On the adjoining Frontier mine, the Mining Corporation of Canada obtained like results and during the first six months of 1923 turned out no less than one million ounces of silver.

Romantic occurrences such as these sustain interest in Cobalt, and provide inducements for extensive schemes of prospecting by diamond-drill and otherwise, based on a close study of the geology.

Gowganda, lying north and west of Cobalt, has provided several deposits of similar ore. The principal one of these is the Miller Lake-O'Brien, a rich deposit operated vigorously for several years. The Castle-Trethewey also contains high-grade silver ore.

The Hollinger Outcrop in 1909

Gold

The prospectors who combed the rocks of Cobalt for silver wandered farther afield, and in 1909 struck rich gold ore on and near the banks of Porcupine lake. Fortunately, several of the discoveries fell into the hands of a group of men who had made a fortune at Cobalt, and were consequently in position to finance the development of a gold mine. Early efforts at mining were halted by the disastrous fire of 1911, in which practically all mine buildings in the new camp, and also many human lives, were lost.

It soon became apparent that the deposits were extensive and capable of being worked profitably. The Hollinger, McIntyre and Dome mines were developed, and production grew apace. The first named mine is worthy to be compared in point of production and value with any on the Witwatersrand. It has upwards of fifty miles of underground workings, raises and crushes 4,700 tons of ore per day, and has a monthly production of over $1,000,000. There is an extensive vein system, and predicated on a workable depth of 3,000 feet, General Manager Brigham has valued the total production at $450,000,000.

The McIntyre adjoins the Hollinger, and receives at depth some of the veins from the latter. Struggling to keep its head above water in the early years of the mine, Manager R. J. Ennis has brought the McIntyre through to an enviable position. Recently at a depth of over 2,000 feet an entirely new body of ore of good quality was struck. The production in 1922 was 103,819 ounces.

The Dome lies some two or three miles southeast of the Hollinger-McIntyre group. The mine receives its name from a dome-like mass of quartz which attracted the attention of the early prospectors. The "golden stairway" runs up the side of this dome, splashed and painted with native gold. Opened as a quarry, the Dome subsequently adopted the shaft-and-level system of working. It is now producing at the rate of between 200,000 and 300,000 ounces per annum. The geology of the Dome indicates that the porphyry intrusions have influenced the deposition of the gold, and in some of the lower levels very rich ore has been found.

In treating the Porcupine ores, ball mills are used for fine reduction, and cyanidation for recovering the gold. Stamps are being largely discarded, and the latest innovation is the substitution of rod mills for ball mills.

At Kirkland Lake there is a principal ore-bearing zone or "main break" running south of, and under, the bed of the lake itself. On this several mines have been developed, including the Teck-Hughes, Lake Shore, Wright Hargreaves and others. The ores of Kirkland Lake are richer than the ores of Porcupine, in some of the mines running up to $25.00 or $30.00 per ton. Further to the south a number of properties have been worked for a number of years with more or less success.

To the east of the main field at Kirkland Lake prospecting has carried favourable geological indications as far as the Quebec boundary and some forty miles or more into that Province, where prospectors have been very busy during the present season.

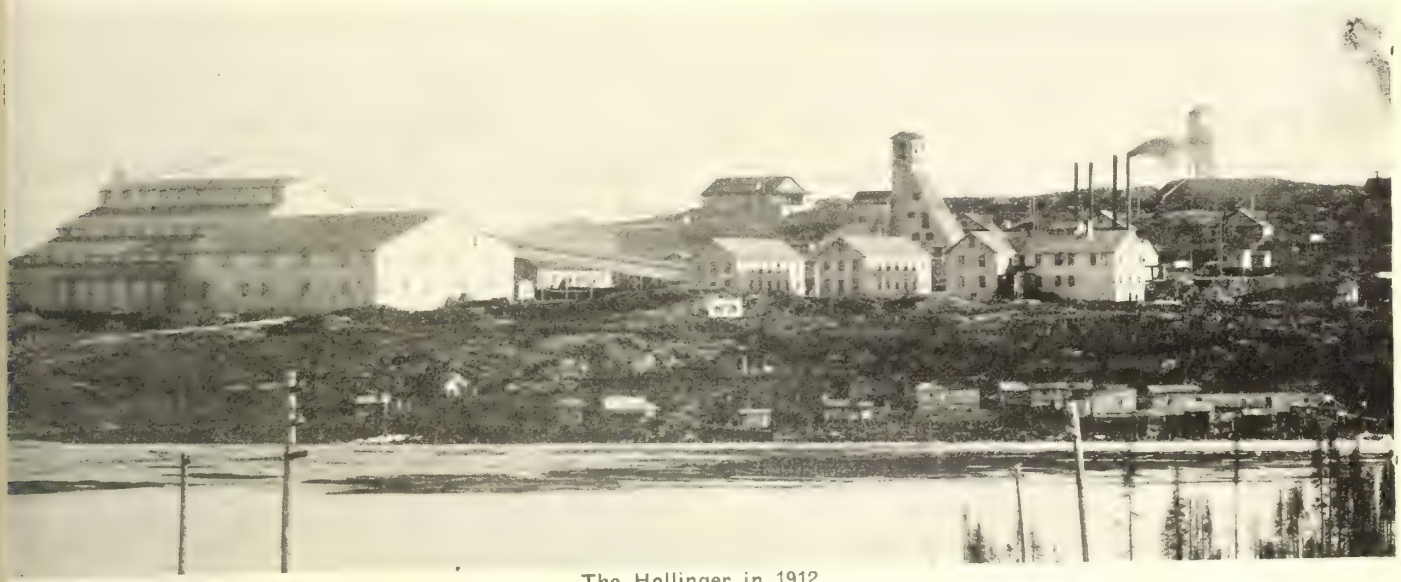
Numerous discoveries of gold have been made in other parts of Northern and Northwestern Ontario. At Night Hawk lake, the Peninsular mine has developed a large body of workable ore and is erecting a mill. The Argonaut mine at Beaverhouse lake, the Associated Goldfields and Crown Reserve at Pancake lake, the Goldale in the Porcupine area, and the Goudreau on the Algoma Central Railway are all under vigorous development, and expect to be turning out bullion ere long.

The production of gold in Ontario in 1922 amounted to

,000,198 ounces, of which 895,409 ounces were from Porcupine, 104,478 ounces from Kirkland Lake, and 310 ounces from miscellaneous sources.

Nickel and Copper

The story of the discovery of nickel in Ontario has also an element of the romantic. What appeared to be large bodies of copper ore were found near Sudbury in 1883 during the construction of the Canadian Pacific Railway. On some shipments of the ore being put through the smelting works at Constable Hook, N. J., the process was attended with great difficulty. On examination it was found that the rebellious element was nickel, and that the mines at Copper Cliff were in reality nickel rather than copper mines.



The Hollinger in 1912

The opening of the deposits synchronized with the notable discovery of James Riley in Glasgow, namely that 3 per cent. of nickel added to steel greatly improved its quality. One of the first applications of this discovery was to the manufacture of armour plates for war vessels. Surface-hardened nickel steel plates proved far superior in power of resistance to any armour plates previously known, and were quickly adopted by the United States navy, and subsequently by the navies of France and Great Britain.

The superiority of nickel steel and the usefulness of the metal for other purposes lead to the establishment of the large industry which now centres at Copper Cliff, Coniston and Nickelton, in the Sudbury area. Nickel being pre-eminently a war metal, the peak of production was reached in 1918, when 1,559,892 tons of ore were smelted and 45,886 tons of nickel produced. The International Nickel Company of Canada is the largest producer, followed by the Mond Nickel Company, and the British America Nickel Corporation. The ore contains an average of 3 per cent. nickel and 1 per cent. copper, and each company has its own method of refining. The Orford process is employed by the International, the Mond er, followed by the Mond Nickel Company, and the Brit- or carbonyl by the Mond, and the Hybinette or electrolitic by the British America.

The close of the war left the companies with large stocks of nickel on their hands, and the high costs during the subsequent period of inflation obliged them to close down or greatly curtail operations. These stocks have now been largely absorbed, and the nickel mining industry is reviving with the prospect of speedily reaching at least the pre-war scale of production.

The foregoing deals only with the four chief metals of Ontario, but the list of the Province's useful minerals is by no means exhausted by mention of iron, silver, gold, and nickel. In truth, the catalogue of the commercial minerals of Ontario is a long and varied one. A number of the minor products provide the basis for important industries. Among these are talc, mica, graphite, feldspar, salt, natural gas, etc., in addition to the more prosaic but not less useful products such as brick, building stone, cement, lime and materials of construction generally. It is a fortunate circumstance that Ontario possesses in great abundance the requisite materials for the substantial and comfortable dwelling houses and structures generally that her northern climate demands.

The Hollinger Today

Geology of Northeastern Ontario

With Notes on Advances in Mining

By WILLET G. MILLER

It is now sixteen years since the mining men of Ontario had the pleasure of a visit from the American Institute of Mining and Metallurgical Engineers. At the time of that visit, 1907, the Province was already noted for its deposits of nickel-copper ores and for those of silver. Since then gold mining has had a wonderful development in the northeastern region, which is now commonly spoken of as the Sudbury-Cobalt-Porcupine region.

A few of those who came in 1907 are to be on the forthcoming excursion. They will note vast changes in the Sudbury area. New plants have been erected, of the most modern type, and large quantities of ore have been developed. During the Great War many users of nickel steel and other alloys of the metal became acquainted with their good qualities. This has resulted in a greatly increased demand for these materials in the arts of peace, and the present activity in the mines and smelters augurs well for the future.

When the Institute excursionists visited Cobalt in 1907 the camp was a little over three years old. They could be shown marvellous outcroppings of ore, and underground, the mines, to use a term that was often employed, were "jewelry shops." Dr. Raymond, the veteran secretary of the Institute, went underground at La Rose mine and expressed his pleasure at the opportunity of seeing the rich veins there exposed. He, or it may have been some other member of the party, advised the young ladies to stand on some of the rich surface outcrops — it would bring them good luck and they "would live happy ever after." This may have been an old Saxon belief, imbibed by the Doctor during his student days abroad!

Now, conditions are changed. Very little rich ore is to be seen at Cobalt. The mills are working on lower-grade material, and have developed processes that are of great interest to the technical man. A paper, by Messrs. Reid, Denny and Hutchison, descriptive of these processes, has just been published and will be distributed during the excursion.

While the spectacular showings of Cobalt are gone, certain outlying cobalt-silver areas give great promise. The excursionists will visit South Lorrain, about fifteen miles to the southeast of Cobalt, where showings of silver ore as rich as those of the mother camp in her palmy days will be seen. There will be other discoveries made in Cobalt itself, and the outlying areas, scattered over a region more than 5,000 square miles in extent, will attract the prospector and the miner for many years to come.

About the time of the last visit of the Institute, or a little earlier, prospectors trained in the Cobalt field began to examine the country farther to the north and northwest. The result has been the development of the gold mines at Porcupine, Kirkland lake and other areas which have attracted world wide attention. The gold production of these areas is referred to in a following paragraph.

During this visit, then, the excursionists will have the opportunity of seeing not only the nickel-copper and silver areas but those of gold as well, a unique triumvirate.

Many promising areas await development. Judging the future by the past, should we not be optimistic?

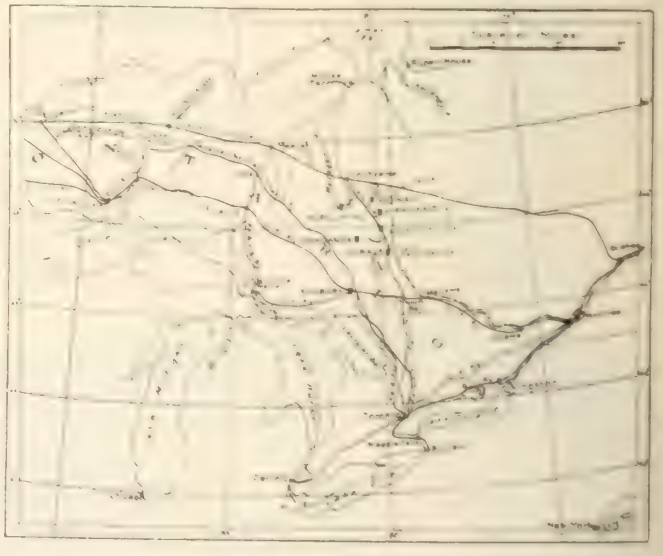
Production

The total production of nickel from the mines of the Sudbury area from 1889 to the end of 1922 was approximately 443,067 tons of 2,000 pounds. The statistics for copper from the area cover a longer period, 1886 to the end of 1922, during which time approximately 259,890 tons of the metal were produced. Platinum, palladium and related metals form interesting by-products of the Sudbury mines, but the statistics are incomplete. From 1904 to the end of 1922, about 331,733,479 ounces of silver have been obtained from the mines of the Cobalt and adjacent areas. A large quantity of cobalt and arsenic have also been produced, together with lesser quantities of nickel and copper. Owing to the fact that the mines did not always receive pay for certain of these metals, which were sometimes lost in treating the ores, it is not possible to give accurate statistics as to production. The value of the gold produced at Porcupine, between 1911 and the end of 1922, amounted to $96,338,114. Between 1913 and the end of 1922, gold to the value of $7,673,966 was obtained from the Kirkland Lake area.

The ore deposits of all three of the areas are in rocks that are classified as of pre-Cambrian age, and are believed to owe their origin to igneous intrusions. At Sudbury the intrusive rock, described on the following pages, is quartz-norite, at Cobalt quartz-diabase, and at Porcupine quartz-porphyry. It is believed that the norite of the one area and the quartz-diabase of the other are genetically connected.

Canadian pre-Cambrian

About two-thirds of Canada is underlain by rock of pre-Cambrian age. There is a similarity in the rocks everywhere. In some areas, of course, certain rocks occur in large volume while others are absent or are found only in small outcrops, and vice-versa. Owing



A large part of Northern Ontario is accessible by railway, as indicated above

to the great mining development in northeastern Ontario, the character and age relations of the pre-Cambrian rocks have been worked out in greater detail here than elsewhere in the Dominion. The following description gives the character of the chief groups in the region:

Relations of Rocks of Northeastern Ontario

Keewatin. — The oldest series known in the region is called the Keewatin. It consists for the greater part of basic volcanic rocks, now represented by schists and greenstones, together with more acid varieties such as quartz-porphyry. Associated with the Keewatin is considerable sedimentary material, consisting of schistose greywacké, jaspilyte, or iron formation, and crystalline limestone, which is, however, not seen in large exposures in any of the three mining areas. These sedimentary rocks are believed to represent the Grenville series of southeastern Ontario.

There are large areas of mineral-bearing rocks of the Keewatin, Timiskaming, Cobalt, Animikie and other series in the pre-Cambrian, which here is undifferentiated

Laurentian Granite and Gneiss. — The rocks next younger than the Keewatin are granite and gneiss. That there were granites older than the Timiskaming sediments is proved by the fact that the conglomerates of the latter frequently contain pebbles and boulders of a light-coloured or grey variety of these rocks. There is doubt, however, about the true nature of certain unconformities that have been described between the Timiskaming and the so-called Laurentian in part of the region dealt with in this article.

Timiskaming. — After the intrusion of the Laurentian into the Keewatin, there was a prolonged period of erosion, during which a thick series of sediments consisting of conglomerate, greywacké and other rocks was deposited. To this series in the Cobalt and Porcupine areas the name Timiskaming has been given. It is known in other areas to the north, south and west of Cobalt and appears to be represented at Sudbury by what Dr. Coleman has called the Sudbury series.

Algoman (Lorrain) Granite. — After the deposition of the Timiskaming sediments an intrusion of granite, characteristically pink in colour, took place. This granite, which occupies large areas, is known as Algoman. The relations of this granite to both the older and younger rocks are clearly shown at Cobalt. The granite, with associated quartz-porphyry, that gave rise to the gold deposits at Porcupine appears to be of the same age.

Cobalt Series. — The period of erosion that succeeded the intrusion of the Algoman granite gave rise to the conglomerate and other rocks known as the Cobalt series. Good exposures of these rocks are to be seen at Cobalt and along the railway to the south and to the north. At Porcupine only small exposures are found. The Ramsay Lake conglomerate of Sudbury appears to be of the same age.

In the Sudbury area there are also other sediments that have been variously classified as regards their age relations.

Nipissing Diabase and Sudbury Norite.—Succeeding the deposition of the Cobalt series came the intrusion of the quartz-diabase which gave rise to the silver deposits of Cobalt. This intrusive is known as the Nipissing diabase. As stated above, the Sudbury norite, with which are genetically connected the nickel-copper deposits, is similar in chemical composition and appears to be of the same age.

Paleozoic Rocks. — To the north and east of Cobalt limestone, with basal conglomerate and sandstone, of Paleozoic age, occurs as outliers on the pre-Cambrian.

With the exception of deposits of glacial and recent age, no rocks younger than the pre-Cambrian are found in the vicinity of Sudbury or Porcupine.

Newer Mining Areas

Kirkland Lake.—The Porcupine area is described by Mr. Burrows elsewhere in these pages. The Kirkland area has now become an important gold producer. The assemblage of rocks is similar to that at Porcupine but gold occurs under somewhat different conditions. Intruding the Timiskaming sediments are various stocks, dikes and sills and Algoman syenite, lamprophyre, feldspar-porphyry and felsite, different facies of one magma intruded in the order of decreasing basicity. The cooling of the intrusive magma was probably accompanied by much shrinkage and faulting along east-west zones in the porphyry and adjacent rocks in planes roughly parallel to the long axes of the intrusions. Through these fractures were deposited the gold-bearing silicious solutions representing the end product of the Algoman intrusions. Porphyry and syenite are the most abundant rocks along the main shear and most of the ore deposits are in these rocks; however, ore occurs in all the other rocks along the path of the shear, with the exception of two diabase dikes which are later than the ore bodies and may be of Keweenawan age. Ore is rarely found in lamprophyre.

The ore occurs at frequent intervals along one major fracture 2¼ miles in length with a strike of N. 70° E, and a dip of from 89° to 85° to the south, occasionally flattening to 50°. The mines, which adjoin one another along this main shearing from west to east are as follows: Kirkland Lake, Teck-Hughes, Lake Shore, Wright-Hargreaves, Sylvanite and Tough-Oakes. In addition to the main fracture there are important branch veins and parallel fractures in a zone 500 feet or more in width.

The four mines in the western half of the area have followed the main zone almost continuously by underground workings for 1½ miles. In the eastern part of the area the vein-bearing zone is over half a mile in width; the main ore-bearing fracture has not been definitely recognized in this eastern section owing to the irregularities of the veins, faulting, drift overburden and insufficient underground work.

The main fracture zone contains two prominent fault planes, called footwall and hanging-wall, which are from a few feet to 40 feet or more apart, the area between being much disturbed with minor faults and slips. The ore occurs over the whole width between the principal faults or near one wall or the other and, in places, beyond the recognizable fault planes or co-called vein boundaries.

The ore at all the mines along the main shear is identical, and occurs as irregular shoots from 30 feet to several hundreds of feet in length, separated by zones of somewhat similar-looking material which may be barren or low in grade. The richer type of ore usually contains lenses of bluish brecciated quartz, the fractures being filled with varying quantities of calcite, dark quartz, dolomite, chlorite, sericite, iron pyrites, gold tellurides, molybdenite, chalcopyrite and, occasionally, some galena, zinc blende and graphite. Frequently the quantity of quartz in the ore deposit becomes relatively small, probably two per cent as compared with the red mineralized porphyry. Again, minute cracks carrying molybdenite, gold, tellurides and a little quartz, extend through the silicified fractured red porphyry, giving a good mill-rock.

The ore minerals are native gold, with the tellurides calaverite ($Au\ Te_2$), kalgoorlite (a telluride of gold, silver and mercury), and petzite ($2\ Ag_3\ Au\ Te$). Other tellurides present are altaite (Pb Te), which is the most common and usually indicates high-grade since it is always accompanied by visible gold; coloradorite (Hg Te); melonite ($Ni\ Te_3$); a sixth telluride was identified by E. Thomson. The minerals present in the ores suggest that they are not high temperature deposits, but that they were formed at considerable depth and exposed by erosion.

The six mines, three of which are from 1,000 to 1,150 feet deep, are developing one vein or lode system, having a total length of 2¼ miles.

Lake Shore Mine
Ten Years Ago

The foregoing description of the Kirkland Lake Area is from a manuscript report by Mr. P. E. Hopkins.

South Lorrain. — The following notes on this area are taken from a report, now in press, by Mr. Cyril W Knight.

Silver was discovered in 1907 at the Keeley mine, and there followed a period of widespread staking of claims, and of active work lasting until the latter part of the year 1913. During this time, which may be called the first period in the history of the camp, there were produced about 2,500,000 ounces of silver practically all of which came from the Wettlaufer. The camp then became almost inactive for eight years. In 1921 rich ore-shoots were discovered and South Lorrain thereupon entered the second period of its history, and now gives promise of developing, for the time being at least, into the most important of the outlying cobalt-silver areas.

The geology of South Lorrain is similar to that of Cobalt. The productive veins occur along the top of the Nipissing diabase sill, both in the diabase and in the overlying Keewatin. In this respect the occurrence is

similar to that at the Timiskaming and Beaver mines in Cobalt. The diabase sill in South Lorrain has the form of a great elongated dome. The productive veins discovered up to the present have been found on the northwest slope of this dome. A feature of the veins is the depth to which pre-glacial weathering has extended. In the Wood's vein, the depth is at least 480 feet . To show the richness of the ore it may be said that a shoot of ore on Wood's vein 102 feet long, with an average height of 35 feet, had produced 900,000 ounces of silver to the end of April, 1923. Detailed descriptions of the geology and mining opertaions are given in Mr. Knight's report.

Other Areas. — Important mining development is taking place in other areas in northeastern Ontario. The names of most of these areas, and their location, are shown on the accompanying sketch maps of the silver and gold regions.

PERSONAL AND GENERAL

Hon. Robert Drummond of Stellarton, Nova Scotia, veteran editor of the *Maritime Mining Record*, spent a few days in Sydney recently. His friends there were delighted to find him in perfect health, as usual, and enjoyed the annual treat of his sparkling humour and pleasant greetings.

Mr. John Taylor, of John Taylor & Sons, London, will visit Kirkland Lake, where his firm has large commitments, undertaken by their Canadian representative, Mr. A. D. Miles. John Taylor & Sons own and manage a large number of well-known mines throughout the world, most of them in various parts of the British Empire. Among them are the Cape Copper Company, Balaghat Gold Mines, Ooregum Gold Mining Co. of India, Mysore Gold Mining Co., Mount Boppy (Australia), Cordoba Copper Co. (India), Champion Gold Reef Mines of India, etc.

Mr. Robert Henderson, Mine Manager, Reserve Mine, Western Fuel Corporation, has resumed his duties after a short vacation. Mr. A. Newbury acted as Mine Manager during Mr. Henderson's absence, and now is acting as Mine Manager of No. 1 Mine during the absence of Mr. Robert Laird, who is away on holiday.

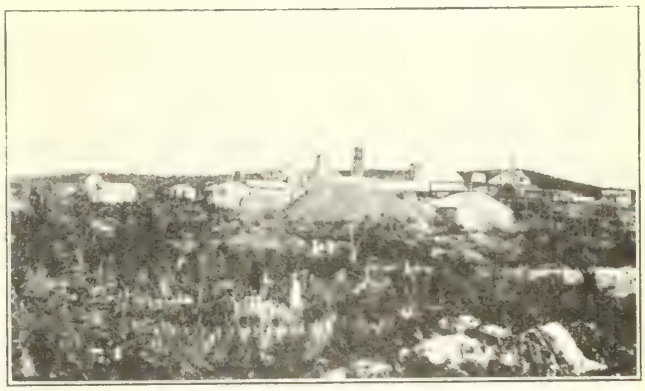
Mr. Morris W. Garman has been appointed Mine Manager of Granby No. 1, operated by the Granby Consolidated M. S. & P. Co., in place of Mr. J. B. Touhey who is on vacation.

Mr. James Dickson, inspector of mines and member of the Board of Examiners of British Columbia, is away on vacation.

Mr. D. H. McLean of Glace Bay, Nova Scotia, assistant to the General Superintendent of Mines, Mr. A. S. McNeil, and Mr. Lionel Frizzel, Chief Electrician of the Dominion Coal Company, are enjoying a well earned holiday subsequent to the strenuous duties of the strike period.

Sir Newton Moore has returned from a visit to the Wabana iron ore mines, where he inspected mines and plants. He left Sydney last week for New Glasgow and from there will go on to Halifax in company with Mr. D. H. McDougall, vice-president of the British Empire Steel Corporation. Sir Newton is an Australian with a long record of public service, including the premiership of W. Australia. Early in life he became interested in military affairs, and during the Great War commanded the Australian military forces in England. He is a director of numerous mining companies throughout the world, including the British Empire Steel Corporation, Hampton Gold Mining Areas (Australia), British Porcupine Development Company, and California Exploration Company.

Mr. H. S. Munroe, general manager of the Granby Consolidated M. S. & P. Co., has been elected a vice-president of the Company.



Vipond Mine and Mill, Porcupine

REPORT ON SILICA DEPOSITS OF EASTERN CANADA

Silica, in the form of quartz, quartzite, sandstone, sand, etc., has been utilized for many years in numerous manufacturing industries. It is widely distributed in nature and is found in all degrees of purity. In the form of sand it is employed in the manufacture of glass, carborundum, and in the steel foundries. In lump form it enters into the manufacture of ferro-silicon, and is also used as a flux in metallurgical operations. When finely pulverized it is used in pottery bodies, and also in the enameling and paint industries.

A report on Silica by L. Heber Cole, recently published by the Mines Branch, Department of Mines, Ottawa, discusses the occurrence, exploitation, and the uses of this product and describes in some detail the many occurrences of this material in Eastern Canada, including many undeveloped deposits that may in the future become of considerable industrial importance.

The principal markets for silica are located in the large industrial centres of the country, such as Montreal, Toronto, Hamilton, etc There are many deposits favourably situated in the provinces of Ontario and Quebec, which if properly operated should be able to compete readily with similar material which at present is being imported from the United States.

This report on Silica, which comprises 199 pages of text, is profusely illustrated with diagrams and photos and is accompanied by a complete set of maps showing the distribution of silica deposits. It may be obtained by application to the Director, Mines Branch, Department of Mines, Ottawa.

PHOSPHATE SHIPMENTS

Shipments of phosphate from the large deposits recently opened up in Morocco are now assuming important proportions. During the first six months of 1923, shipments were 84,000 tons, against 82,000 tons for the whole of 1922

A Short Summary of the Mining Act of Ontario

By T. E. GODSON, K. C.*

The present Mining Act of Ontario may be briefly outlined as follows:—

Staking. — Anyone over eighteen years of age who takes out a Miner's License, at the cost of five dollars, may prospect for minerals upon Crown Lands or lands of which the mining rights are reserved to the Crown, and may take up, work and acquire title to a specified area, by staking out and recording a Claim, performing and filing proof of the prescribed development work, namely, two hundred days, obtaining a survey, if in unsurveyed territory, and paying $3.00 per acre in surveyed territory, and $2.50 in unsurveyed territory, patent being given in fee simple upon completion of these requirements.

Claim Tax. — After patent or lease issues from the Crown, the Claim is subject to a tax of five cents per acre, payable annually. If default is made for two years the land may be forfeited to the Crown, pursuant to the provisions of the Mining Tax Act.

Transfers. — The Claim or any share or an interest in it, may at any time be sold or transferred to any Licensee, and transfers, agreements and other instruments executed by the recorded holder may, and to ensure preservation of priority must, be recorded in the Recording Office, being the depository of title prior to patent, in the same manner as the Registry or Land Titles Office is after patent.

Certificate of Record. — The validity of every Claim is open to dispute for sixty days after recording, and when this time is past, a certificate of record may be obtained, and on satisfactory proof of performance of work a certificate of such may also be obtained and these, in the absence of fraud or mistake, are conclusive evidence of performance of the requirements of the Act.

Disputes. — Questions of disputes arising under the Act, either between individuals, or between an individual and the Crown, are adjudicated by the local Recorder or by a special officer called the Mining Commissioner, subject to appeal to the Supreme Court of Ontario.

Safety Regulations. — Rules and regulations are prescribed for the operation of mines (whether on patented or unpatented lands) looking to the safety of employees and the protection of the rights of other miners and for the collection of statistics.

Act is Comprehensive. — Legislation by Order-in-Council is not resorted to, although to a certain extent adopted as of necessity, during the late war. There are no rules and regulations for procedure except those contained in the Act. The comprehensive scope of the Act, and its definiteness of detail, make it lengthy, but give greater certainty and security to the interest of the holder.

Mining Commissioner. — The Mining Act of Ontario is unique, providing a special tribunal presided over by the Mining Commissioner, for the trial of all questions and disputes arising before or after patent as to the validity or subsistence of a patented or unpatented Mining Claim, or as to its transfer or ownership, or as to any other rights or privileges, or interests conferred by the Act, subject to appeal to the Supreme Court of Ontario.

The position of Mining Commissioner is the equivalent of that of a Judge, and the procedure leading to trial is simple and expeditious. All matters are brought to a hearing by obtaining and serving an appointment after dispute of notice of claim has been properly filed, and the issue is heard, if possible, within the Mining Division where the land is situated. All decisions must be entered in writing and the parties affected notified by registered mail. An appeal to the Supreme Court of Ontario is allowed in most cases, if taken within fifteen days after decision rendered and filed.

Forfeiture. — Rights or interests in a Mining Claim become automatically forfeited to the Crown on the non-performance of the requirements of the Act relating to the (a) taking out of a License; (b) performance of work; (c) filing of work; (d) application for patent. These forfeitures may be relieved against upon terms, if application is made to the Mining Commissioner within three months after the loss of rights arises, or at any time under a general relieving section (86), if the facts and circumstances warrant. All applications for relief from forfeiture, if adverse interests have arisen, are heard and disposed of in open Court and upon notice to all interested parties. These curative sections make the Act more elastic and pliable.

Rights and Easements. — Another salutary provision of the Mining Act is that which has reference to rights and easements required for or in connection with proper working of the mine or mill for treating ore or quarry. The owner, lessee or holder or person entitled to work the same, may obtain and have vested in him by Order or award of the Commissioner, made after hearing such parties interested as may appear, or on appeal from him, the right to construct ditches and flumes, to discharge, drain or divert waters, and to store and take water, establish rights-of-way through or over any land or water, or roads, tramways, etc., for the transmission of electricity, and for the depositing of tailings, slime or other waste products upon the land of another owner. No such right shall be granted unless all injury or damage caused to any other person thereby can be adequately compensated for, nor unless in all the circumstances it seems reasonable and fitting to grant the same, and in the exercise of that right so granted no unnecessary injury or damage shall be done to the land, property, or rights or interests of other persons, and all injury and damage which may be caused to any person by the granting and exercise of any right obtained under this Section shall be fully compensated for. There is a right of appeal from the decision of the Commissioner under this Section. It is found that the Section is a very desirable one and in most cases the right asked or remedy sought for is usually arranged amicably after the matter has been aired before the Commissioner.

*Mining Commissioner for Ontario.

Mines Inspection in Ontario

By T. E. SUTHERLAND*

Regulations regarding the protection of workmen and the safe operation of mines form an important part of the mining laws of Ontario. The enforcement of these regulations is the duty of the mine inspectors, whose powers and duties are governed by statute.

In a general way it may be said that these regulations are based on the South African Act and on the "Rules and Regulations for Metal Mines" published by the United States Bureau of Mines as Bulletin 75. Bulletin 75 gave the findings of a committee comprising W. R. Ingalls, James Douglas, J. R. Findlay, J. Park Channing and John Hays Hammond, who on the invitation of Dr. Holmes, Director of the United States Bureau of Mines, served as a committee of the United States Bureau of Mines, their object being to draft a uniform mining law for the States of the Union.

Besides the copper-nickel mines at Sudbury, the silver mines at Cobalt and the gold mines of Porcupine and Kirkland Lake, Ontario has a great variety of mines, including barite, feldspar, fluorspar, granet, graphite, gypsum, hematite, iron pyrites, lead, mica, molybdenite, siderite, sodalite and talc. Included as mines for purposes of administration are all quarries, clay pits and sand and gravel pits in the Province.

Powers of Inspectors

The difficulties of drafting legislation that would properly safeguard large operations, and at the same time not ask for absurd observances at small properties, can readily be understood. In order to avoid these difficulties, unusual powers are given to the inspectors. The enforcement of the regulations is necessary only where in the opinion of the inspector they are "reasonably applicable", and a further blanket clause is added giving the inspector power to take any steps he may deem necessary to protect the health or safety of the workmen. Furthermore the decision of the inspector is not subject to review by any other officer of the Department. The inspectors are appointed by the Crown and can only be removed for cause. In the appointment of an inspector two requirements are insisted upon, — that he be a graduate in Mining Engineering of a Canadian University and that he have 5 years' experience in actual mining operations. As an example of the satisfactory way in which this system has worked out it may be mentioned that the abolition of dry stopers underground was accomplished through the coöperation of the mine managers and that no special legislation was necessary.

Character of Regulations

The regulations cover the usual requirements for safe mining practice, such as ventilation, handling and storage of explosives, haulage, scaling, hoisting, and electrical installations. An electrical inspector looks after the last. With a temperature ranging from 100°F. in summer to 50° F. below in winter the storage, handling and thawing of explosives is a serious problem. When we realize that one Ontario mine uses 3,000,000 lbs. of nitro-glycerine explosives yearly, the magnitude of this task can be appreciated.

Ontario mining laws have one requirement which I do not believe is asked for in any state of the Union, that is, that hoisting ropes be regularly subjected to a breaking test. For this purpose the Government have installed at Toronto a Tinius Olsen 300,000-lb capacity, 4-screw type testing machine with automatic beam and speed regulated cones and Bristol recording chart, showing extension and pull. A nominal charge is made for these tests. Some of the rope manufacturers are making use of this machine.

Penalties for non-observance of the mining regulations are provided for. These range from $10. to $100. for workmen, and $100. to $1,000. for companies. During 1922 seven prosecutions were made, three being against workmen and four against companies. The Department has not yet lost any action instituted against a company or a workman.

In 1922, 1,320 inspections were made, 1,133 works were visited, and 2,689 instructions were given regarding unsafe conditions or practices. Approximately 12,000 men were employed during the year at the mines. The accident rate worked out at about 110 non-fatal and 2.5 fatal per thousand men employed. Inquests are held and attended by an inspector in the case of all fatal accidents.

Workmen's Compensation Rates

The assessment per $100 of pay roll made by the Workmen's Compensation Board is based on the actual cost of the accidents occurring in each class during the previous year, and consequently shows the accident hazard of each class. The adjusted rate for 1921 and the provisional rate for 1922 were as follows:

	1921 Adjusted	1922 Provisional
Silver Mining	$2.25	2.25
Treatment of ores, with heat, in a silver mining industry	1.10	1.10
Treatment of ores, without heat, in a silver mining industry	.60	.60
Gold mining	2.40	2.40
Treatment of ores, with heat, in a gold mining industry	1.20	1.20
Treatment of ores, without heat, in a gold mining industry	.60	.60
Nickel or nickel-copper mining	2.75	2.75
Treatment of ores, with heat, in a nickel or nickel-copper mining industry	1.40	1.40
Treatment of ores, without heat, in a nickel or nickel-copper mining industry	.60	.60
Mining N. O. S.	2.25	2.25
Treatment of ores or minerals, with heat, in an industry in this group	1.10	1.10
Treatment of ores or minerals, without heat, in an industry in this group	.60	.60
Iron smelting, as a business	2.00	2.00
Treatment of ores or minerals, with heat, N. O. S. as a business	2.00	2.00
Treatment of ores or minerals, without heat, N. O. S. as a business	.60	.60
Refining of nickel, as a business	2.00	2.00
Sand, shale, clay or gravel pits	3.00	3.50
Quarries, as a business; stone crushing	6.00	[illegible]

* Chief Inspector, Dept. of Mines, Toronto.

It will be noted that the Workmen's Compensation rates show a very high hazard for quarry work compared with mining. Quarry operations being carried on above ground, in daylight only, with plenty of room and principally during the summer months, one would expect fewer accidents compared with underground operations. The casual type of labor employed and less efficient management are, I believe, the causes for the higher accident rate.

It may be safely said that the accident rate depends more on the mental attitude of the management towards accidents than on mine inspection. Ontario mines are exceptionally safe to work in, standard mining methods only are used, the equipment is all that could be desired, there is a good class of labor, 66 per cent, being English, Canadian or American, and the management is efficient.

ONTARIO'S ADVANTAGES AS A MINING COUNTRY

by T. F. SUTHERLAND

1. **Location.** — The mining districts of Northern Ontario are nearest to the financial and industrial centres of Canada and the United States. The distances from Toronto are as follows: Sudbury, 260 miles; Cobalt, 331 miles; Kirkland Lake 392 miles; and Porcupine, 482 miles. Toronto is 565 miles from New York City.

2. **Accessibility.** — Pullman trains run into all the camps; there are express, telegraph, local and long distance telephone service and motor roads in every camp.

3. **Climate.** — It has the advantage of the climate of the North Temperate zone, with an elevation not over 1,000 feet above sea level. It is one of the healthiest climates anywhere in the world.

4. **Government.** — It has an eminently stable form of government. Its inhabitants are an English speaking, self-governing, law-abiding people.

5. **Mining Laws.** — The Ontario Mining Act is considered one of the best. Lands, minerals, etc. belong to the Province and are granted in fee simple; title is unassailable. There is a special official with judicial powers and title of "Mining Commissioner" who settles all disputes among prospectors and others in local centres.

6. **Taxation.** — Taxes are levied only on profits. A 3 per cent yearly tax is due on all profits over $10,000. and up to a million, and 5 per cent on all profits over a million. Part of this amount is returned to the municipality for local purposes. Profits are determined by the "Mine Assessor", a special official appointed by the Crown.

7. **Power.** — An abundance of hydro-electric power is developed by independent companies and delivered to the mines at reasonable rates.

8. **Timber and Water.** — It is a well watered and well wooded country; timber and water for mining and treatment purposes are abundant in every district.

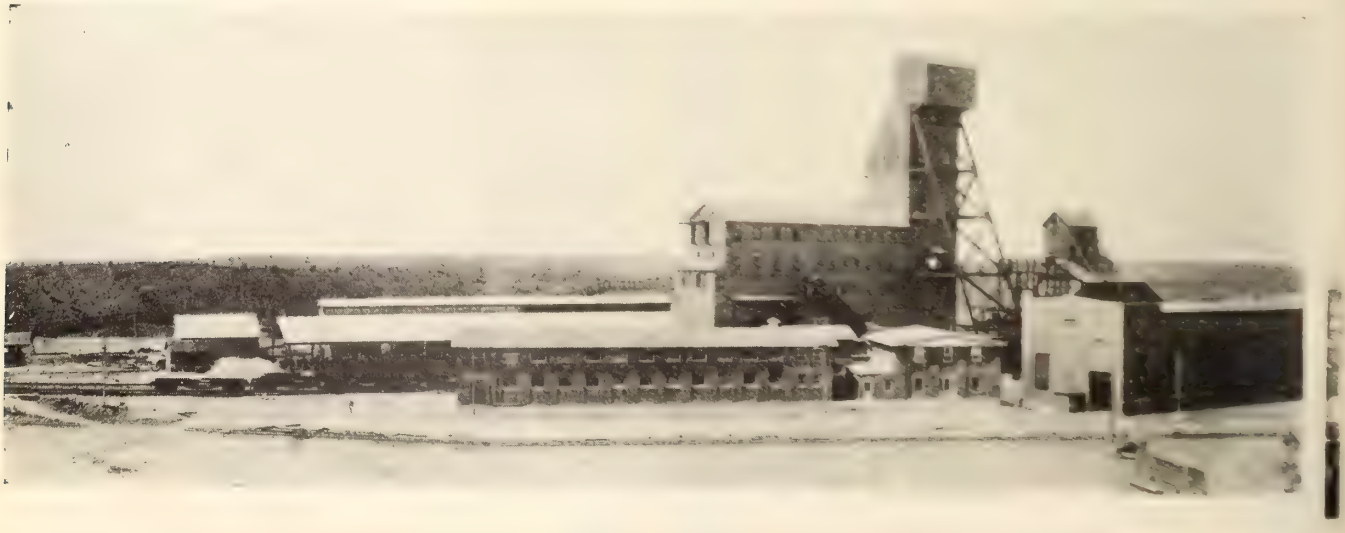
9. **Ore Extraction Problems.** — There are none. The ore-bodies are regular, enclosed in rocks that give self-supporting walls. Caving ground, swelling ground, high temperatures, gaseous mines, dusty mines, big flows of water, none of these conditions exists.

10. **Labour.** — There is a plentiful supply of good labour. A majority of the labour is English-speaking. The climate is conducive to physical activity, and the miners are a steady, dependable lot.

11. **Profits.** — This is the supreme test. Cobalt to the end of 1922 produced $221,000,000 and paid out in dividends $94,000,000 or 42½ per cent. Porcupine to the end of 1922 produced $108,000,000, and paid out as dividends $28,000,000 or nearly 26 per cent. Complete figures for Sudbury are not available, but for the years 1911 to 1915 inclusive the profits were almost $10. on every ton of ore treated.

12. **Future Possibilities.** — A large portion of the Province, geologically favourable to the occurrence of ore deposits, has not been prospected. Much of the area prospected has wonderful future possibilities owing to increased geological knowledge. In the past two years, ten properties in the gold belt that now may be called mines have been developed on mining lands taken up prior to 1909.

Conclusion. — Compare Ontario with other mining countries. — Mexico, Australia, Africa, India. All have certain advantages, but none have all the advantages that Ontario possesses.



Creighton Mine

Sudbury --- Ontario's First Mining Camp

Its Influence on the Province's Mining Industry

BY T. F. SUTHERLAND*

The first mining of any importance in Ontario was at the Bruce Mines on the north shore of Lake Huron in 1846, when an English company mined the copper-quartz veins of this district, making a concentrate that was shipped to England. These operations showed a profit for many years, but ceased in 1875. It cannot be said however, that they had any marked effect as regards the establishment in this province of a successful mining industry, and it was the discovery of the Sudbury deposits during the construction of the C. P. R. in 1883 that was destined to prove to the world that the northern part of this province is a storehouse of mineral wealth. Few people, possibly, realize the effect that this discovery had in the advancement of the province as a whole. Progress was slow at first, for two reasons: first, the metallurgical processes for the recovery of nickel had to be developed from the very beginning, and secondly, the value of the new industrial metal, nickel, had to be demonstrated and a market found for it.

Early Development

Government surveyors laying out base lines for townships first drew attention to mineralization in this district. Salter in 1856 reported that while surveying a meridian north from Whitefish lake he noticed considerable local attraction between the 5th and 8th mile, and at 43 chains north of mile post VI there was "an appearance of iron in trap." This was within two hundred yards of the Creighton mine, which afterwards developed into the world's greatest nickel mine and gained the distinction during the high metal prices of the war of being the largest high-grade mine in the world, or the highest-grade large mine. Railway navvies blasting out an iron-stained rock carrying copper pyrites in a cut four miles west of Sudbury during the construction of the C. P. R. in 1883, where now the Murray mine is, noticed the second indication of Sudbury's nickel wealth, and some of the pioneers, always ready to take a chance, began to apply to the Government for the gossan ridges of this timbered country as mining claims. Copper ore was shipped out in 1887, and then the real troubles of the pioneers began. Difficulties in treating these copper ores were experienced and a chemist for the Orford company found these were due to nickel.

From that day to the present the success of the industry has depended on the research chemist. The first problem was how to separate the nickel. Then uses for the enormous quantities available had to be developed. The metallurgy of nickel was worked out by the two large companies and each evolved a process of refining distinct in practice, the Orford process an adaptation of English methods, and the Mond process a brand-new one based on laboratory experiments. The Norwegians worked out a third refining process, the Hybinette, which is now used by the third Sudbury company. The smelting processes are the same.

From 1900 up to the time of the World War the growth was gradual, with an increase in production of about 10 per cent. a year. Then during the war the companies had a market for all the nickel they could make. Following the war the research chemists came back into prominence as the saviours of the industry. Commercial uses had to be found for immense quantities of nickel which the mines, smelters and refineries were prepared to turn out. In this they have been so successful that today the production is equal to pre-war figures and the industrial uses are still increasing. We thus see that the discovery of nickel at Sudbury developed research chemists who, besides making the mining industry in this district successful, have added enormously to the industrial life of the nation.

Mining Methods

The nature of the ore-bodies and the character of the enclosing rocks did not necessitate any marked variation from accepted mining practices. However, the tonnages hoisted in later years were large and the problem of changing over from low tonnage to high tonnage mines, and equipping the mines underground and on the surface to handle economically these large tonnages, developed engineers whose successful results in the Sudbury district have been copied

*Chief Inspector of Mines, Toronto.

Smelter of the International Nickel Company at Copper Cliff.

in other mining districts of Ontario. Men trained under these engineers are in demand in every mining camp in the north.

Geology

I am not prepared to state what effect, if any, the working out of the geology of the Sudbury district has had on the geological problems of Northern Ontario. As the years rolled by and the enormous ore bodies of Sudbury were developed, as the marvellously rich veins of Cobalt continued to produce, as the gold mines of Porcupine and Kirkland Lake increased in area and gold content, and as the geological relationships were worked out, a marked confidence in geologists has been engendered. The value of their science has been proven and one of the outstanding features of the industry in Ontario today is the great amount of geological prospecting that is being carried on. Conservative mining companies are willing to spend as much as $250,000 in a single venture if their geologists will say the formations are favourable.

Mining Development

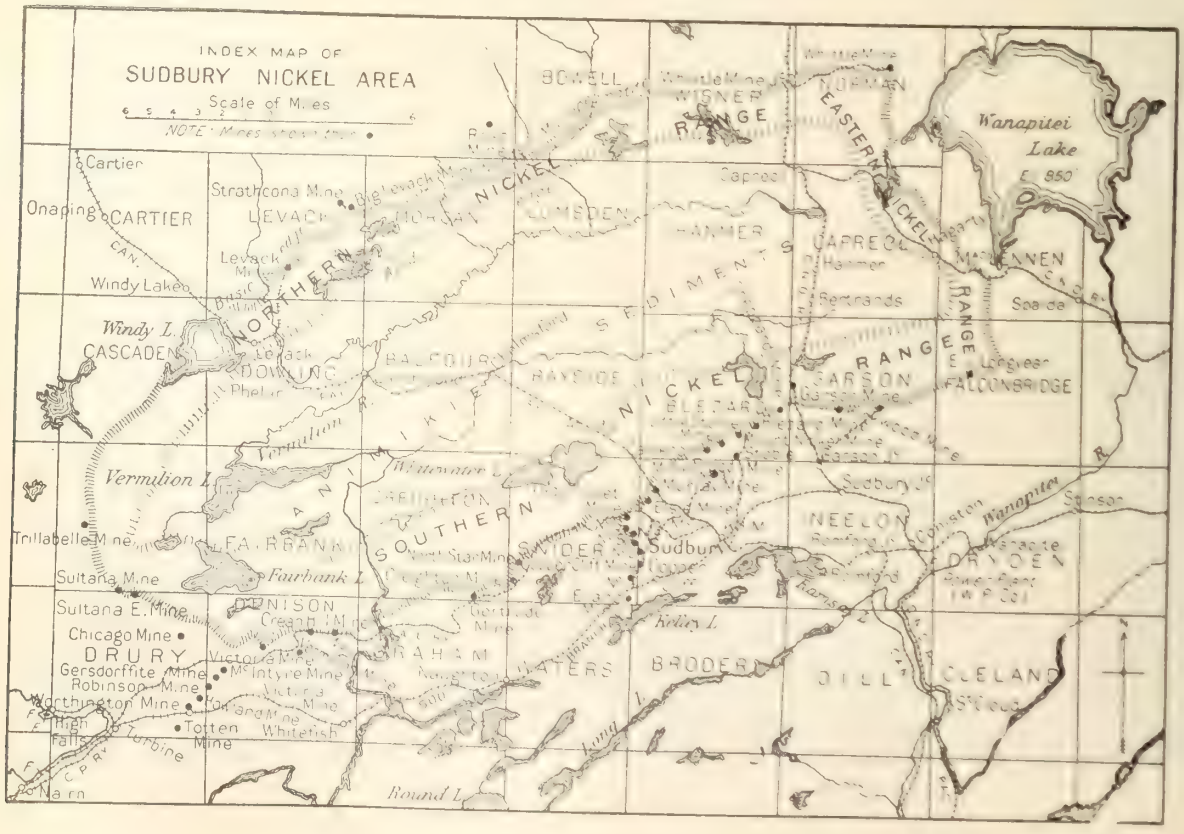
The success of the two Sudbury companies, one American and one British, with the consequent payment of dividends to American and British investors did an immense amount of good in creating confidence in the possibilities of Ontario as a field for mining investment. The companies, being equipped for mining, smelting, refining and marketing nickel and having problems to solve continually in these departments, did not, as companies, seek for deposits of other metals; but they readily investigated all nickel occurrences. Officials and stockholders were, however, continually investigating the newer camps and investing in them, and are responsible for a considerable amount of the advance made; and today some of the boldest mining programmes in Northern Ontario are financed by money made in Sudbury and directed by technical men who received a large part of their training in the nickel district.

Settlement

The development in a new district of an industry which in 1918, its peak year, produced approximately 46,000 tons of nickel, valued at 26½ million dollars, and over 23,000 tons of copper, and which paid out over $7,000,000 in wages and gave employment to 4,000 men, cannot be otherwise than the foundation of the prosperity of that district. Towns and villages with a population of 20,000 are practically dependent on this industry, and a large farming community owes its prosperity to the high priced market the mines make possible for their product. A great many of these farms are owned by men who at one time were employed by one or other of the companies. There are Finn and French-Canadian communities where every land holder is an ex-miner or smelterman.

Political

Perhaps it would be just as well to touch this phase of the subject a little gingerly. During the war, prior to 1917, the export of nickel from Canada was the subject of a great deal of newspaper criticism. The British-owned company escaped this criticism, as their refinery was in Wales. The American company's refinery was in New Jersey. In spite of assurances from the British and Dominion governments that the export of nickel from the American company was satisfactory to the British Admiralty, the press continued the controversy and political parties made capital out of it. A Nickel Commission was appointed by the Provincial Government to investigate the whole question. The American company built a $5,000,000 refinery in Ontario, which now handles all the matte of their Sudbury plant that is refined. Monel metal is still made from exported matte.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SUDBURY NICKEL AREA
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Sturgeon Falls Generating Station
Sturgeon Falls Pulp Co. Limited
Sturgeon Falls Paper Co. Limited
Sturgeon Falls Power Co. Limited

The Nickel-Copper Industry's Record

By ALEXANDER GRAY*

The nickel-copper industry of Ontario may be credited with a metallic output of nickel, copper and rare metals, valued approximately at $241,000,000. This valuation is more or less nominal, and is based upon averages as presented in the year-to-year Provincial reports. To the end of 1922, the grand total value of the metals extracted from the ores of the Sudbury district may be summarized in this way:

Nickel	$176,700,000
Copper	60,800,000
Platinum	3,600,000
	$241,100,000

This grand total is hardly representative of the market valuation of the metals; yet it suffices to demonstrate the achievements of the nickel industry despite adversities. No official statistics on the subject have appeared since 1920 else it would be possible to complete the following wage bill of the nickel industry:

Years	Total Wages	No. of Employees
1908	$2,139,055	2,416
1909	2,605,128	3,251
1910	2,973,172	3,317
1911	1,830,526	2,439
1912	3,543,419	3,736
1913	3,291,956	3,512
1914	3,424,352	3,859
1915	3,835,179	4,538
1916	4,920,720	5,306
1917	6,113,572	3,747
1918	7,983,526	4,378
1919	4,139,523	3,004
1920	6,704,883	4,007
	$53,525,011	

This record dates from the panic of 1907. After the Armistice the nickel industry, beset by the universal industrial depression and subjected to special surtaxes, found the heavy capital expenditures incurred for war purposes called for complete retrenchment. Refineries and smelters, huge plants, were forced into almost complete idleness; staffs were reduced to the minimum; only taxes were maintained; yet the International Nickel Corporation between September 1902 and December 31st 1920 had expended this in its local mining and smelting division:

Labor and Salaries	$35,913,755.32
Mine Supplies	13,915,453.36
Coke	6,485,869.68
Coal	2,439,869.68
Wood	685,578.31
Freights	11,736,230.97
Contractors	2,114,233.77
	$73,190,529.65

* Consulting Mining Engineer, Montreal.

Even though Canadian nickel-copper in the matte went to Bayonne and Clydach, and the credit taken for the industry in its record of output be inadequate, its spending power and constructive influence in the development of the Canadian mineral industry in general, cannot be questioned. Matte still goes to Wales, Pennsylvania and West Virginia, but the nickel-copper industry is now almost completely Canadianized, and in time it may cease to be regarded as an industrial Ishmaelite, denied equal taxation notwithstanding its post-war plight.

If Canada was supersensitive because its war metals were refined abroad, the reason for revenual reprisals has been removed in large measure. The nickel industry during and since the war has expended about $35-000,000 on new plants. Therein has been its weakness and its strength, for it is over-trained for greater outputting, and Dr. Corless has put it on record that there is at least 100,000,000 tons of nickel-copper ore in the ascertained reserves.

The Mond Company has expanded in every direction. The British-America Nickel Corporation cost more than it may be able to surmount although its establishments attain almost complete efficiency. The International Nickel Corporation of Canada and its parent organization, the International Corporation of New Jersey, are ready to meet the world's requirements. Their Port Colborne refinery, which cost about $6,000,000; their Spanish River dam and hydro-electric development that cost about $3,200,000; the Creighton Mine surface equipment, which cost about $1,250,000; besides the extensions to the furnace and converter plants; to say nothing of the three-and-a-half million dollars rolling mill at Huntington, West Virginia, bespeak more of optimism than post-Armistice business warranted.

Granting that the Mond rolling plant in Clearfield, Pennsylvania, and the International mill in West Virginia reflect the altered conditions confronting the nickel industry, and that diversified markets will be created for Monel metal and for multiform nickel products, there is no trepidation among producers, even though there be hesitation on the part of consumers and prohibitive market conditions in Europe. The latest bulletin on the subject issued by the Ontario Department of Mines, had this encouraging view:

Results for First Quarter of 1923

"Production from the Sudbury area is on the increase following the post-war depression. The Mond Company has a plant at Clearfield, Pa., for the production of malleable nickel, and the International Company now operates at Huntington W. Va., a rolling mill for nickel and monel metal products. The industrial uses of nickel are rapidly expanding. In April an announcement was made that mine, smelter and refinery of the British America Nickel Corporation would be soon placed in operation after a prolonged shut down. During the period the Mond and International companies smelted 192,118 tons of ore and produced 10,748 tons of nickel-copper matte. The Mond Company made no shipments, but the International shipped 2,271 tons of matte to Huntington,

W. Va. and 6,234 tons to Port Colborne, Ont. At the latter plant 6,764 tons of matte were treated."

Supplementing these figures are the following for the first quarter of 1923 and 1922:

Products	Quant. (3 mos.) 1923	1922	Val. $ (3 mos.) 1923	1922
Platinum metals, ozs.	20	.....	1,740	....
Copper (metallic), lbs.	2,872,540	22,553	460,441	1,310
Copper in matte exported tons	549	5	109,875	897
Nickel in matte exported tons	1,270	.....	507,836	....
Nickel oxide, lbs	3,140,298	25	451,213	7
Nickel, metallic, lbs.	4,761,768	522,184	927,406	129,055

While the nickel industry is more prosperous, it has reason to be impatient about the restoration of its prestige in its own sphere. Current production compares favorably with pre-war conditions but competition is keen and for a while the market price of nickel was the lowest since 1895. Certainly production costs are better. The quality of Monel metal is superior to what it was, and it has been ascertained that the market for it is capable of large expansion. The Mond plant in Pennsylvania has been rolling sheets and drawing tubes, malleable nickel being the main product. The British America prospects are more hopeful. The rehabilitation of the whole industry is progressing rapidly.

Apart from the increasing output perhaps the most informative data bearing upon what the nickel industry has passed through are contained in the consolidated general profit-and-loss statement of the International Nickel Company of New Jersey for the years 1920, 1921 and 1922:

	1922	1921	1920
†Earnings	$ 373,986	$4,059,607	$6,064,76[illegible]
Oother inc.	234,267	1,106,974	30[illegible],71
Gross inc.	607,353	5,166,581	6,365,47[illegible]
Exp. tax, etc.	523,749	978,731	1,478,41[illegible]
Depr., depl., etc.	881,351	2,158,150	2,141,32[illegible]
Invent adj.	537,834	.....	.....
Net loss	1,335,581	*2,029,700	*2,745,73[illegible]
Pfd. divs.	534,756	534,756	534,75[illegible]
Deficit	$1,870,337	‡$1,494,944	‡$[illegible]

†Earnings of all properties, after deducting manufacturing, selling expense, ordinary repairs and maintenance.
*Income.
‡Surplus.

ARCTIC EXPLORATION

A month ago the famous "Arctic" sailed once more to the North, in charge of Mr. J. D. Craig. Captain J. E. Bernier is the skipper. The purposes of the voyage are manifold, including exploration, the provisioning of some Arctic posts, and the administration of justice. The personnel includes surveyors, naturalists and engineers.

NATURAL GAS PRODUCTION

The production of natural gas in Canada has now reaced a position of considerable importance. In 1922 it was 15,000,000 thousand cubic feet, valued at $5,500,000. Alberta, with 5,867,000 thousand cubic feet, is catching up rapidly to Ontario, which retains the lead with 7,800,000 thousand cubic feet. New Brunswick's quota for 1922 was 754,000 thousand cubic feet.

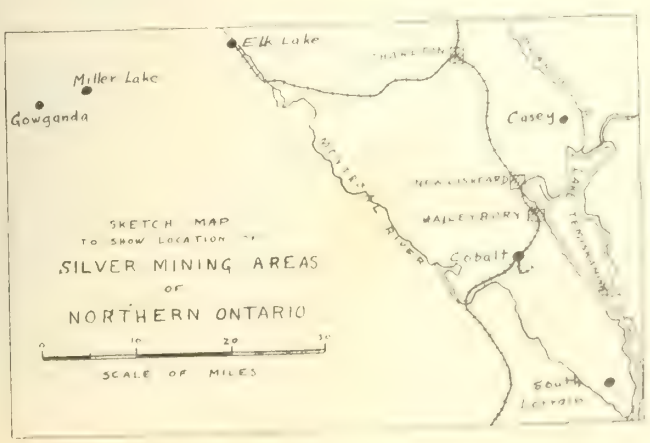
Surface Plant at Coniagas Mine, Cobalt

The Influence of Cobalt on Canadian Mining

By J. MACKINTOSH BELL

The discovery of the extraordinarily rich silver veins of Cobalt marks the real beginning of successful precious metal mining in Ontario. In 1903, when Cobalt's brilliant career began, there was not one prosperous gold mine in operation in all Canada, and silver, except as a by-product or a co-product, was in much the same position as gold. Even the placer fields of the Klondike had passed their zenith.

The bonanzas of the famous Silver Islet Mine in Lake Superior, rich as they were, were not sufficiently extensive to draw very widespread attention to the potential mineral wealth of the pre-Cambrian areas of Ontario, and such interest as was aroused was dissipated by the generally unfavorable results attending the development of the silver-bearing deposits on the Lake Superior mainland. As gold-field after gold-field, — Rainy River, Wabigoon, Michpicoten, and others — came into the limelight, and as each failed to live up to the hopes of the discoverers, popular enthusiasm waned to the vanishing point. Even the most optimistic began to be dubious of Ontario's ever producing a really successful gold or silver mining field.



Probably this succession of disappointments explains why Cobalt failed in the first instance to appeal to an apathetic and suspicious public, notwithstanding the authoritative support the locality early received from Dr. W. G. Miller. The promoter and the broker came, as in the case of the earlier discovered fields; but in this instance there was real foundation for the boom that followed. And the boom at Cobalt had one good effect. It induced widespread prospecting. The first discoveries were soon followed by numerous others within a radius of four or five miles from the original location, while within a few years the subsidiary camps of Elk Lake, Gowganda, South Lorrain, and Casey had been found, with deposits similar to those of Cobalt.

Meanwhile, Cobalt had settled down to the real business of mining and the world awakened to its importance. Canadians were, not unnaturally, the first to become interested, but United States capital was not dilatory in grasping the opportunity of securing holdings in the new camp. English investors, still smarting from the succession of shocks administered by the Rossland and Lake of the Woods fiascos, moved more cautiously; but ultimately even they bought their way in, at prices that might have staggered the original investing pioneers.

The Town of Cobalt in November, 1905

The widespread quest for new Cobalts led to a search for gold as well. Larder Lake was early located, and while the large hopes of its importance were at first doomed to disappointment, the hunt did not cease, and when in 1909, rumors of discoveries of gold in the Porcupine region were current, they were not disbelieved. The stage was better set for action than in 1903. Money in large quantity had been made. The spirit of successful adventure was abroad. The McMartin-Timmins-Dunlap group, — the earliest of the Cobalt pioneers,—had sold their Cobalt property, La Rose. A large part of the purchase price received was forthwith diverted to the purchase and development of the now world-famous Hollinger property. Similarly, interests connected with the International Nickel

Company early acquired the Dome property, and others, identified with the development of the Temiskaming Mine at Cobalt, brought the MacIntyre to success. One has only to recite such names as McMartin, Dunlap, Timmins, Hay, and Drummond, to be reminded how Cobalt gave the impetus to the beginning of Porcupine.

Cobalt had so enlarged the mining vision as to enable the pioneers of Porcupine to undertake, with relative equanimity, expenditure on a scale much larger than was current before the silver eldorado had been discovered. A mental attitude has much to do with mining. It is even conceivable that Porcupine might now be as inactive as the Lake of the Woods district, but for the finding of Cobalt. Gold, indeed, had been discovered in Porcupine as early as 1901, before Cobalt existed. As with Porcupine, so it has been with Kirkland Lake. In short, Cobalt may be considered the germinal source of modern precious metal mining in eastern Canada, if not the whole of Canada.

As was the case with the rich ores of Ballarat and Kalgurli in Australia, and Cripple Creek in Colorado, so the bonanza and easily marketed ores of Cobalt brought great wealth to those fortunate enough to become early interested. Money flowed to Toronto and other Ontario cities and towns, enriching men in every walk of life. Montreal felt the effect of the revival of Canadian mining, as also did New York and other American cities, especially Buffalo. London, not kindly disposed towards Canadian mining projects after its failures in Western Ontario and British Columbia, not unnaturally was slower to respond, but with the successful developments of the Mining Corporation at Cobalt, and still later of the Associated Gold Mines of Western Australia, at the Keeley Mine in South Lorrain, there was an answering echo, even in that great mining centre.

It is not only in Ontario that Cobalt money has been reinvested. Certain of the coal mines of Alberta owe their successful exploitation to Cobalt mines, while various mining and industrial enterprises throughout the length and breadth of the Dominion and even beyond its confines are financed by Cobalt money.

For twenty years Cobalt has been pouring forth a silver stream from its treasury of wealth. The zenith of production in ounces was reached in 1911; since that date there has been a steady, though fluctuating decline. The questions are often asked: "What is the future of Cobalt?" "Will the camp be rejuvenated by new discoveries?" Much light has been shed on this subject at various times by Miller's notable investigations, and more recently by the vigorous pronouncements of Knight.

The geological principles that govern the position of the ore deposits of Cobalt are well-known. The rich ore-shoots occur in close proximity to the contact of diabase sills, with Keewatin conglomerates and slates of the Cobalt series, or of greenstones of Keewatin age, — either within the diabase or within the intruded rocks, and in connection with both the upper and lower contacts of the sills. At first it was thought not improbable that the richness of the deposits had a close connection with nearness to the surface; but events have shown that this surmise requires marked modification. Mere depth below the surface — at any rate within the limitations of 2,000 feet — has in itself little if any bearing on enrichment. While there are obviously many other structural features to be considered by the seeker after new ore-shoots, the important factor to be borne in mind is relationship to the sill contacts.

In the section of the silver district immediately adjacent to Cobalt itself, the greater part of the easily-won ore, much of which either actually outcropped on the surface or occurred close to the grass-roots, would seem to have been mined; but until recently there has been little effort to prospect the deeply-buried contacts, excepting where they were followed downward along the dip of the sills, in the progress of practically continuous mining work from the surface. Within the last few years, however, a more courageous policy has been followed. The enterprising programme of La Rose in sinking a relatively deep

Nipissing's Low-Grade Mill.

shaft to prospect a hidden zone on its Violet property has met with success; within the last few months exploration at the adjoining Colonial mine has been similarly rewarded at greater depth. Even more interesting work is under way in the Beaver mine. Here, rich ores were mined both in Keewatin greenstone and in diabase along the upper contact by the original company, which had the temerity to sink a shaft 1,500 feet deep right through the sill, and commence exploration on the lower contact. Some rich ore was found, but comparatively little work was done, and it has remained for the Coniagas Company, which now holds the property, to take up the problem with renewed zest. Who knows what wealth may remain to be unearthed here and elsewhere along these deeper zones?

In the outlying sections of the silver districts courageous finance, backing geological hypotheses, is meeting with its reward. In South Lorrain, sixteen miles south-east of Cobalt, following a bright beginning in the successful operation of the Wetlauffer Mine, dark days fell upon the area, and it was not until success had attended the efforts of the London operators of the Keeley, whose sinister early history had served to retard the development of the locality, and later those of the Mining Corporation on adjoining properties to the north, that mining men directed serious attention to this isolated section. Today South Lorrain is going a long way to make up for the diminishing output from Cobalt itself.

Similarly, progress has been made in Gowganda, sixty miles north-west of Cobalt, where the Miller Lake-O'Brien Mine has been a wonderful producer for many years and where the adjoining Castle seems to be coming into its own.

The area in which veins of the Cobalt type are found, is large. Apart from those named, there are outliers from the central section at Rabbit Lake, thirty miles to the south; at Matabichouan, twenty-five miles to the south-east; at Casey, fifteen miles to the north-east; at Elk Lake, forty-five miles to the north-west; at Maple Mountain, thirty miles to the west, and elsewhere. In many, if not all, of these localities, surface indications would seem to be promising. Here would appear to be a wide field for detailed geological work, which should lead to the opening up of new and promising properties, or resurrecting hopeful prospects long since abandoned.

Gold Mining in Ontario

By BALMER NEILLY*

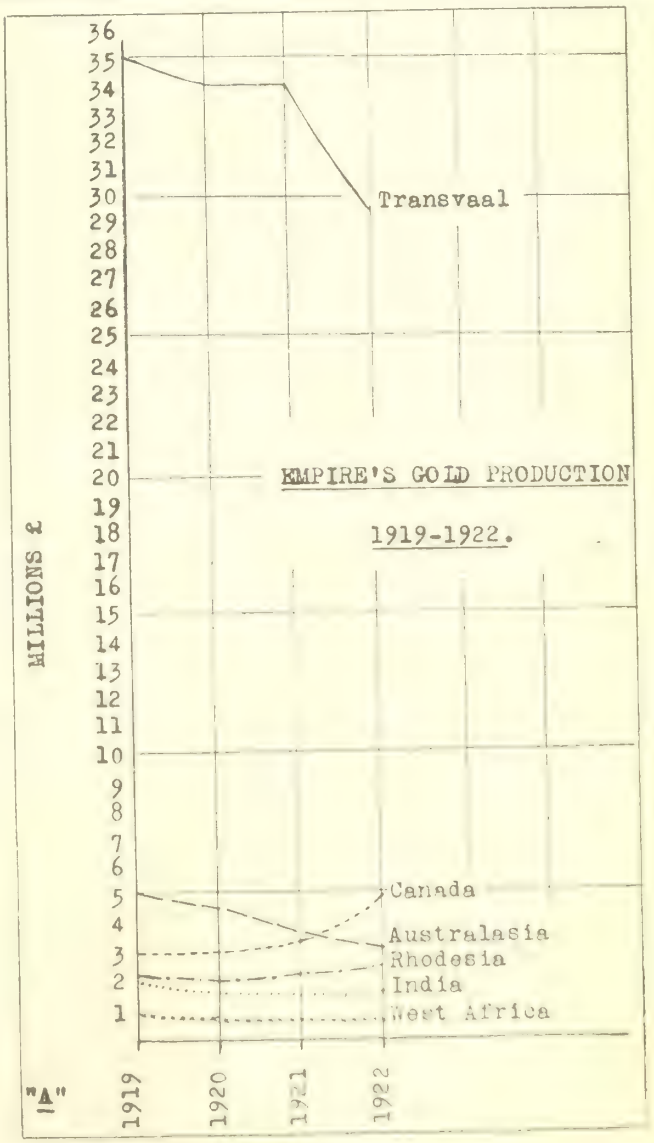
The reader may sometimes wonder why, lately, there is so much publicity given gold mining in Ontario, even to the exclusion at times of any mention of silver, nickel, copper and the production of other metals and non-metallic minerals. Some will say "it is the fashion;" but that explanation will not suffice. The commercial world is looking for gold. It matters not whether it is to be mined in South Africa or the Yukon, it is needed and must be obtained to provide greater elasticity in exchange. The record of every gold producing country is under constant scrutiny. With the world's gross production falling off, year by year, and one country after another posting decreased production, a country or province that increases its production by leaps and bounds stands out as a welcome relief. Ontario is that Province, and what is more natural than that the attention of mining investors the world over should be focused on the gold fields of Northern Ontario?

The relative position and the trend of production within the British Empire is indicated in graph "A," and when it is remembered that Ontario was responsible last year for approximately 80% of Canada's total gold production, the record of this province is apparent.

The American Gold and Silver Institute has estimated the world's gold production for 1922, and from their figures graph "B" has been constructed. This shows the percentage increase and decrease of each country's production in 1922, as compared with 1915.

Graph "C" indicates in a striking manner the rapid growth of the gold mining industry in Ontario during recent years.

The first discovery of gold in Ontario was made in Hastings County, in the eastern part of the Province, 57 years ago. Discoveries followed in the Lake Superior region in 1871 and still later in 1892 in the Rainy River district. The latter district was considered to have real merit, and for a time the future of gold mining in Ontario was considered full of promise. In 1899 our gold production was valued at nearly half a million dol



* Secretary, Ontario Mining Association

lars. But unfortunately the record could not be maintained. Production gradually dwindled, and by 1911 the value of our gold production had fallen to $42,637.

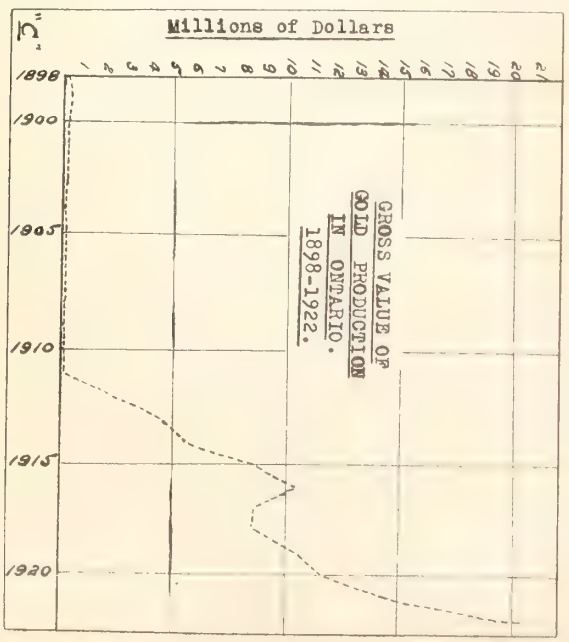
In 1909 the Porcupine camp was discovered. New finds were announced shortly after at Kirkland Lake and in numerous other districts, and while these two camps are at present the only producers, real progress is being made in outlying districts such as Larder Lake, West Shiningtree, Matachewan and in many other localities, probably just as important as these. Districts once abandoned are being re-opened in the belief that with modern and improved methods, costs can be reduced and operations made profitable. New production is coming from a point mid-

1922		% Increase or decrease over 1915.
Africa	$163,650,000	- 24.9
North America	90,043,000	- 28.9
United States	49,096,000	- 51.4
Canada	25,447,000	+ 34.1
Australia	20,000,000	- 59.2
Asia	19,500,000	- 30.6
Mexico	15,000,000	+136.3
South America	11,000,000	- 27.1
Central America	2,000,000	- 32.7
Europe	600,000	- 97.9
	Net Result	- 34.5%

"B" WORLD'S GOLD PRODUCTION, Estimated by AMERICAN GOLD AND SILVER INSTITUTE.

way between Kirkland Lake and Larder Lake. At the latter point we are informed that mill construction may be expected in the near future. At Night Hawk Lake, east of the Porcupine camp proper, production may be expected early in 1924. Generally speaking, there is a feeling of optimistic expectancy throughout Northern Ontario, and it can certainly be said that to-day there is more prospecting being done and more serious mining development under way than at any previous time in the history of mining in Ontario.

To get a proper conception of the rapid growth in gold mining in Ontario, the reader is again referred to graph "C." While Porcupine was discovered in 1909, it should be noted that the camp at that time was made up of a few claims staked in a wilderness and 30 miles from the nearest railway. The preliminary work was faced under un-



usual difficulties; but enthusiastic faith and perseverance won out and the larger properties were approaching the production stage when the terrible fire of 1911 laid low the whole district, and the mining properties, so far as equipment was concerned, were back practically where they started.

In the meantime a branch of the T. & N. O. Railway had been constructed into Porcupine, and without hesitation work was once more commenced at the mines. Progress was rapid and most satisfactory. The mines here and at Kirkland Lake were just nicely out of the prospect stage and looking forward to steady production, when the war broke out. The best men exchanged pick and shovel for a gun. The companies in Porcupine and Kirkland Lake struggled along as best they could, but a labor shortage necessitated the curtailment of development work. High prices forced the treatment of ore higher in grade than the then mine average. Some mines were closed down.

Conditions toward the close of the war were very difficult, but to-day that is all changed. Men are available; increased hydro-electric power is being provided. The mines are responding favorably to development. Experience is establishing the cost of production and enabling the different mines to adjust their grades of ore to the required conditions and to estimate their positive reserves with some degree of accuracy.

In 1922 Ontario increased the value of its gold production over 1921 by approximately 41%. It stands to-day as the largest gold producing state or province on the North American continent, and everything points to a continued and satisfactory growth during the years to come.

Eighty-five per cent of the total area of Canada is largely dependent upon the mining industry for its colonization and development. Providence has dealt kindly with Ontario, but adjoining provinces share the ownership with us of the great pre-Cambrian area, and may in due time, in friendly rivalry, challenge our present leadership.

Too long have we estimated Canada's future upon the basis of its agricultural resources alone. Its mineral wealth and mining possibilities must be given the position their importance demands, and the day may not be far distant when mining may even challenge the leadership of agriculture, among the basic industries of this country.

To show that Canada's production of mineral wealth has been consistent and very satisfactory, the following table is appended—

How Value of Canada's Mineral Production has Increased.
Average Value of Annual Production over Five-Year Periods.

1887-1891, inc.	Average $14,[illegible]
1892-1896, "	" 19,91[illegible]
1897-1901, "	" [illegible]
1902-1906, "	" [illegible]
1907-1911, "	" [illegible]
1912-1916, "	" [illegible]
1917-1921, "	" [illegible]

THE KATANGA AND SOUTH AFRICA

The development of the mineral riches of the Katanga region of the Belgian Congo is of prime importance to the Union of South Africa, not only because it has afforded an outlet for the re-investment of profits from the gold and diamond mines, but because South African ports and railways will always serve that inland region.

Gold Milling in Northern Ontario and on the Rand

By G. J. MACKAY*

To mining engineers and metallurgists, especially those making their first visit to the mills of the Porcupine field, a short review of the history of milling practice in Northern Ontario and in the world's greatest gold field, the Rand, may be of interest.

Even those metallurgists engaged in the recovery of metals other than gold and silver find, from a practical as well as from an economic point of view, the developments and present practice in the recovery of gold not without interest. Many of them have had to do with the precious metals in their earlier years and most are more or less deeply interested in the wet treatment of ores, or its possibilities. The mechanical side of hydrometallurgy has, in most of its details, been developed in gold mills.

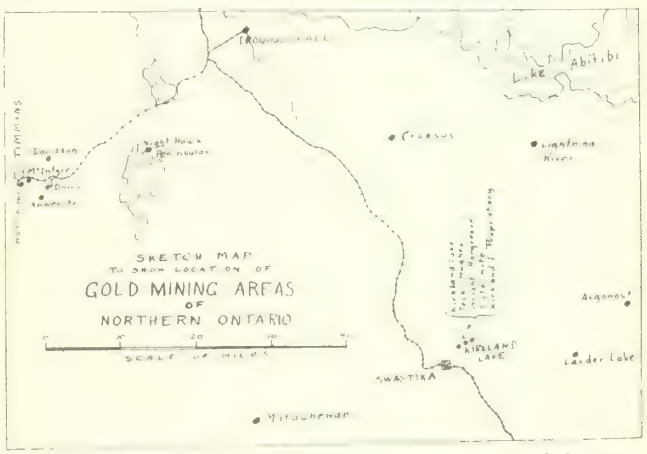
Ontario Has One-Eighth of Rand Production

Northern Ontario and the Rand do not make such an ill-mated pair for a metallurgical comparison. Although Ontario produces annually gold equal to only one-eighth of that produced yearly in the Transvaal, its mining field is young and is growing in importance, while the Rand is scarcely holding its own. The greatest gold field the world has ever seen had been a steady producer for twenty-five years when the first bullion bar was poured at the Dome mine in 1912. The great mines of Porcupine are scarcely into their stride; the Simmer and Jack and the Robinson, world famous for a generation, are nearing exhaustion and other scarcely less well known Rand mines are completely worked out. Yet, as old mines of the West and Central Rand are exhausted, new ones are brought into the producing list on the wide area of flat-lying reef of the Far East Rand. The younger field looks hopefully to the future; the older, after viewing with just pride a glorious past, turns with entire confidence to the prospect of a long and productive future. The man who speaks of Northern Ontario as the coming Rand is an optimist indeed: eight mines, large and small, are producing; all the larger and most of the smaller are increasing in stature; many promising properties are showing up well in development; new areas for the prospector are being discovered every year; but it will take many times these eight mines at their highest stage of development to make a second Rand.

Similarity and Contrasts

Of the great gold fields of the world, Northern Ontario and the Transvaal have ores, from the chemical point of view, amongst the easiest to treat. The gold dissolves readily in weak solutions with a low consumption of cyanide. Physically the ores resemble each other in some respects: each is low in sulphides, the Rand ore much lower than that of Ontario; in each, the greater part of the gold is very finely disseminated so that fine grinding is essential, though there is a considerable amount of really coarse gold in Porcupine ore and little in the Rand; in each 50 to 60 per cent. of the gold is free milling. But in the most important physical characteristic, they are entirely different: Ontario ore is comparatively soft and easily crushed, some of it being a very soft schist; Rand ore is one of the hardest and toughest met with anywhere and, also an important matter to the mill man, extremely abrasive because of the splintery nature of even very fine particles.

The differences in the methods of accounting in the two fields, especially the marked difference in the charges included in milling costs, makes a comparison of treatment costs difficult. Apparently in Ontario they are considerably higher than on the Rand. As to efficiency, conditions are so entirely unlike that a comparison is impossible. The difference in the crushing qualities of the



two ores has been mentioned. The types of labour are as far apart as they can well be: Rand mill men are all well trained by a long apprenticeship and Kaffirs do the unskilled work. The cost of supplies on the Rand is very high, as practically everything used is brought from Europe or America and five hundred miles inland by an expensive rail haul. Power is costly though generated from comparatively cheap coal. The one field has an extremely rigorous winter climate; the other has sunny summer days the year round with rarely a temperature of 90 deg. in summer and a little frost for a few nights only in winter.

Rand Practice a Steady Development

A comparison of the development of metallurgical practice on the Rand with that in Northern Ontario is not without interest. In the case of the Rand, the practice is distinctly a development and largely, until re

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Panoramic View of McIntyre and Hollinger from the North

cently at least, a home product. Rand metallurgists, or most of them, are conservative. The Mines Trials Committee in 1911, tried out a home-made Dorr thickener—and condemned it; one of their leading metallurgists took much convincing in regard to the Butters filter. Some of them, however, would show themselves most progressive if they had a free hand. Most of the development there in the last twenty-five years has been along the lines of refinements in their own class of equipment and its use. In Northern Ontario, on the other hand, it has scarcely been a case of development. To begin with, ideas as to treatment were adopted from Rand and American practice. Some apparatus and some modes of procedure were found unsatisfactory and were replaced by others, as well or better known. The directing heads of the different properties were ready to install the most approved type of treatment plant and try it out on a working scale. In South Africa things moved in the self-contained English way; in Ontario, what was found perfectly satisfactory under similar conditions in any part of the world was considered good enough for at least a pilot mill. In the former case, development began from the days of the stamp mill with its amalgamating plates, before cyaniding was worked out; in the latter, nearly every present day crushing and cyaniding device was already on the market. and the flow sheet for a readily treated ore requiring fine grinding was pretty well agreed upon by American mill men.

In 1912, standard Rand practice included heavy California stamps with 1-4 to 3-8 in. screen openings; one tube mill (5 1-2 ft. by 22 ft.) to ten stamps with cone classifiers in circuit giving a product all passing a 60-mesh screen; amalgamation of the tube mill discharge; classification by cones to sand and through 200-mesh slime; sand leaching; Rand (intermittent) slime decantation treatment, and zinc boxes. New mills were departures from this in having screens to remove fine material from battery feed, 6 ft. by 16 ft. tube mills, Pachuca agitators, Butters filters, and zinc dust precipitation. No "standard" mills were replaced by this more modern equipment. Efficiency of crushing was compared on the basis of through 90-mesh (I. M. M. Standard) product. Some of the metallurgists on the Reef were beginning to doubt the efficiency of stamps and to look to rolls as an alternative; a ball mill had been tried and found to be a failure on the extremely abrasive ore. Some even then felt that they would like to try all-sliming as they believed that the additional extraction and low cost of slime treatment as compared with sand treatment would more than pay for the increased cost of crushing.

Ontario Mills Approaching a Standard Practice

At the time this stage in the development of Rand practice was reached, the Porcupine mills were erected. The Dome and the Hollinger copied the Rand as to means of crushing, but both decided that greater economy would come from all-sliming. The McIntyre was a step ahead in installing a ball mill instead of stamps. All three have retained all-sliming, the Dome departing from it in 1913 for the sake of greater tonnage at the least additional cost, only to return to it again in 1918 as the nature of the ore changed with deeper mining. The Dome alone used amalgamating plates in the tube mill circuit; the management is not sorry now that these were retained as their use results in a fairly uniform grade of cyanide heads from a most erratic day to day tenor of mine output. The Hollinger differs from most mills treating a fairly sulphide, readily cyanided gold ore in that they remove roughly a concentrate for special treatment. Their concentrating tables also serve much the same purpose as the Dome amalgamating plates by removing coarse gold. The men responsible for the operation of the Hollinger mill are convinced that the tables are worth while.

At the three mills, more confidence was placed in the newly developed means of handling slime than that shown on the Rand. The McIntyre installed Dorr equipment with continuous decantation to remove the gold solution; the Hollinger adopted Pachuca tanks and Moore filters to be followed shortly by an addition of Dorr equipment with continuous decantation; the Dome used Pachuca tanks and Merrill slime filter presses.

Later developments at Porcupine have been in the direction of the practice at the McIntyre. Rolls follow gyratory breakers to reduce the ore in preparation for initial grinding; ball mills were added instead of stamps when additions were made to the mills; the Hollinger, after exhaustive tests made in 1922, is to have its stamps replaced by rod mills. An interesting feature in Dome practice is the use of blankets below the amalgamating plates to catch liberated gold that does not amalgamate and high grade concentrate; the blankets retain more gold than do the plates. The three mills have, of course, Crowe installations for removing dissolved oxygen from the gold solutions on their way to precipitation.

The five Kirkland Lake mills are all of the same type, the type that Porcupine's experience of eight years or so seemed to indicate as the most economical for the district. In all, the ore is crushed to about 80 per cent through a 200-mesh screen by means of ball mills and tube mills charged with small steel balls, all the pulp is treated as slime, no amalgamation is practised, Dorr thickeners and agitators and Dorr counter-current decantation systems make up the uniform type of cyanide plant. One, the Teck-Hughes, uses filters, as does the Hollinger, to reduce loss of dissolved gold and cyanide in the residue from the continuous decantation plant. At both these mills the added cost is said to be justified.

McIntyre Mine and Mill, from the West, looking over Pearl Lake.

Modern Rand Mills

On the Rand, since 1912, development has been slow. There have been two very good reasons: few new mills have been erected, and the mills in use, built in a country where construction costs are high, have given good extraction at costs so low that to attempt to better them by scrapping expensive plants has seemed an extremely doubtful policy. One may summarize the lay-out of a typical Rand mill built in recent years as follows: Breaking in jaw crushers, washing, hand sorting of waste, breaking again, screening to remove ore already fine enough for the tube mills, crushing with Nissen stamps giving a 30-ton duty, tube milling using chunks of ore instead of pebbles (an old story there), amalgamation with plates in a separate building, cone classification to sand and slime, sand collecting and leaching in one set of tanks, thickening of slime pulp to remove excess mill water, air-lift agitation with solution, Butters filtration, Crowe de-aeration of solutions, and zinc dust precipitation.

The favourite successors to stamps in this country, ball mills or rod mills, seem as yet impossible on Rand ore. Rolls would seem out of court on such tough and extremely abrasive ore. Butters filters meet the situation in their slime plants: they are positive in action, giving a uniform tonnage and wash in warm and in cold weather; settling is much retarded when solutions are cold and any kind of slime settling plant is far from satisfactory there in winter.

New State Areas Mill

The latest Rand plant, the New State Areas mill, which began crushing in May last, is revolutionary as to Rand practice. Symons disc crushers reduce the ore to about one inch. This product goes to a tube mill-Dorr classifier circuit. The tube mills are 6 1-2 ft. by 20 ft., thirteen of them for a 1,700-ton mill. Amalgamation is not used. The ore is all-slime treated. The excess solution from the crushing plant is removed in square concrete settling tanks; Brown (Pachuca) tanks of double the usual horizontal cross-section are used; Butters filters are retained.

The radical departures are fine grinding without stamps and dispensing with amalgamation. The most interesting feature is the former. What is the cost of this additional fine grinding, and is the greater recovery from all-slime than from sand and slime sufficient to more than pay for it? Is the disc crusher the substitute for stamps that has been looked for so long?

It is probable that the more refractory nature of the ore the farther one goes east on the Reef has much to do with this radical change in treatment. At older mines, even twelve miles east of Johannesburg, it was early found that much finer grinding than that of common Rand practice was necessary. Also, for some years back amalgamation has been given secondary attention, no special effort or added cost being justified as "the cyanide would get the gold."

Tube Mill Practice and Blanket Strakes

A striking difference between Rand crushing practice and Porcupine is in the coarseness of the tube mill feed. It was found in the former case that feed as coarse as three-quarter inch was perfectly satisfactory: the larger pieces were broken, by the large "pebbles" used, soon after they entered the tube mill. The first pulverizing of Porcupine ores seems to be most efficiently done by ball mills; these, however, do not seem to be suited to the hard, abrasive Rand ore. At the New State Areas, the unusual number of tube mills for the tonnage and their great diameter mean that they will, with the large chunks of ore used as a crushing medium, do the work that the combined ball mill-tube mill units do in Ontario. However, the disc crushers and large ball mills, though ever so efficient on ore from the flat-lying reef of the deep-level mines of the Far East Rand, may be quite unsuited to other Rand ores. The greater pressure of hanging wall on this flat reef has resulted in considerable fracturing of the ore, making it more easily crushed.

Lake Shore Mill, Kirkland, (now being enlarged)

A recent innovation in many Rand mills is the replacing of amalgamating plates by corduroy blanket strakes, not simply adding them below the plates as at the Dome. These catch most of the liberated gold and the "black sand" concentrate. The blankets are periodically replaced and washed. The product is graded on a Wilfley table and the greater part is ground in a small ball mill with mercury and the resulting amalgam retorted. This reduces the loss of mercury, lowers labour costs, removes the danger of amalgam theft, and makes possible crushing in cyanide solution with its advantages of shorter treatment and less mechanical loss of cyanide and gold with the tailing. As to mercury poisoning, at its worst it affected only the men who did the retorting and melting and still have it to do.

Evidently most Rand mill men continue to believe in lowering the gold in their cyanide heads as much as possible without too great expense.

Rand Metallurgists Conservative but Alert

An American gold metallurgist looks upon his Rand confreres as extremely conservative. However, he must consider the conditions they have to face: Directors at a distance guide the destinies of many of the mining companies, the plants are large, construction costs are very high, the ores are unusually difficult to grind, and the mill workers, especially battery men, are perfectly trained by a long apprenticeship and years of service so that the operating of present equipment is nearly perfect. To desert well-tried friends for new, however attractive, makes anyone pause. Every Rand metallurgist must be more than interested in the outcome of the departure at the New State Areas; without a doubt some of them have had hopes of some day being free to make just such a grand experiment.

It is interesting to note here that fifteen years ago crushing in cyanide solution had been practised for some time in the mills of one Rand group, and that a type of continuous decantation was tried in connection with it. Also it has been claimed that an "air lift vat" was in use on the Rand before Brown's Pachuca agitator was known there.

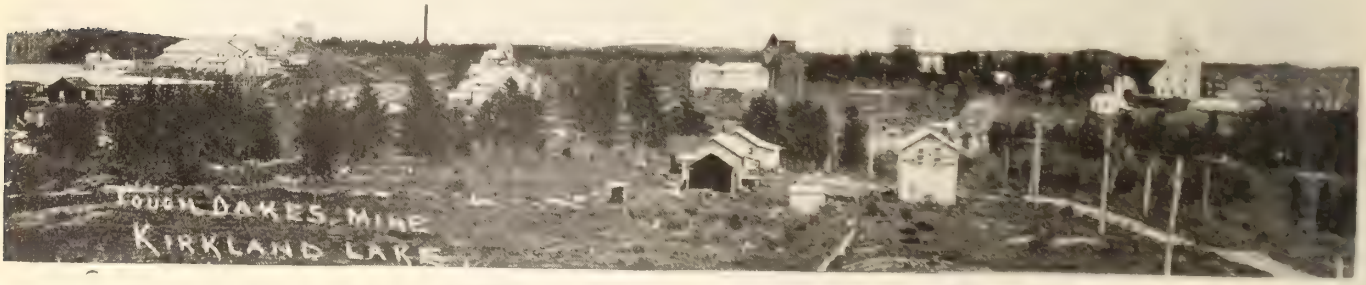
Nowhere did the Crowe process receive a warmer welcome than on the Rand. The very weak cyanide solutions possible and therefore most desirable in treating their slime made zinc dust precipitation unsatisfactory; even with zinc boxes much trouble was encountered with the weak solution, an excessive amount of "white precipitate" forming; the Crowe process removed these difficulties and reduced the consumption of cyanide and zinc.

A visitor to a Rand mill, except a very old mill, may well admire it and its operation. The mill is designed for a certain flow sheet, built along the lines laid down, operated for many years more like a factory than a mining plant, maintained in the best of repair and kept neat and clean by "cheap Kaffir labour" and the operators are skilled from long practice in that or a similar plant. The stamp mill, especially, and its operation are models. The long life ahead of the mine makes for substantial plant construction and the conservative policy of the directors does not favour changes during or after erection. To crowd tanks and other equipment under as small a roof as possible is unnecessary in such a climate; much of the plant is in the open, even the tube mills at some plants.

A Rand Plant in Panorama

Many details are rather striking to an American visitor. Lack of space makes tailing disposal an expensive operation in many mills: sand dumps are like small mountains and can be seen stretching in a white string toward the horizon; slime dams are built up in their own growing slime walls to a height, at some older mills, of nearly 100 feet. Mechanical equipment is as simple as it is possible to make it; the average English engineer looks upon the American as a man of complex mental processes who delights in concrete evidences of them. The mills are on level ground, much pumping is essential, and head for flow is the least possible for the sake of power economy. Bucket elevators and plunger pumps have gone the way of the conspicuous old tailings wheel and pohle air lift; centrifugal pumps are used for every possible purpose. Pumps, when at all possible, even at the expense of much piping, are grouped in one building; all receive their supply from above their own level; belt drives are favoured to avoid motor trouble from spills. Cone classifiers have been, until recently, the only kind used; they do good work but require ingenious devices for regulating the under-flow. Except in the latest mills, one well located point will give a view of battery, tube mills, and plates; a second, a view of the open air cyanide plant, except the extractor boxes. The flow sheet can be seen spread out almost as on a printed page; there is room for a straight-away lay-out that is not possible in the cold winter climate of our northern or mountain gold mining districts.

Porcupine, and especially Kirkland Lake, are comparatively new fields untrammeled by tradition or fixed mill practice; the Rand is an ancient as gold fields go and is set in its ways. The former began with largely "modern" practice and is rapidly perfecting it; the latter is coming slowly to similar systems of gold ore treatment, but with admirable caution, giving due consideration to undoubted advantages in such treatment of their more refractory ores, but never losing sight of the low costs and high extraction of their own well-established practice.



Tough-Oakes Mine, Kirkland Lake, and Adjacent Properties

Porcupine Gold Deposits*

With Special Reference to Producing Mines

By A. G. BURROWS**

The Porcupine gold area is situated in the northeastern part of Ontario, being part of the district of Cochrane. The south boundary of the township of Tisdale, in which are situated the large producing mines, in in latitude 48° .27′-54″. The principal town is Timmins, which is 485 miles distant by rail from Toronto.

The area first attracted general attention when gold was discovered on a number of claims in 1909. Several of the earliest discoveries were on properties that developed into large mines. The precious metal has been found on a great number of claims in the area, but only few of the discoveries have so far been developed into profitable mines. The problems of structural relations are gradually being solved in the camp, and it is reasonable to believe that additional mines will be added to the list. Until the advent of Porcupine the mining of gold ore in Ontario had not been a profitable venture.

Production

Since the discovery of gold in Porcupine, the area, up to the end of 1922, has produced $96,341,098, or about 89 per cent. of the total gold won in Ontario. The greater part of this gold has been extracted from ores from the Hollinger, Dome, and McIntyre mines, while smaller mines, like the Porcupine Crown, Vipond-North Thompson, Newray, and Dome Lake have contributed respectable amounts to the total. Some gold was also obtained from the Davidson, Clifton, Porcupine Pet, and Three Nations.

During 1922, Porcupine produced $18,592,087 in gold (including some silver), which represents about 73 per cent. of the total production of the Dominion of Canada during that year.

Geology

The principal rock formations of the Porcupine area belong to the older part of the pre-Cambrian. The oldest rocks are Keewatin age, predominantly lavas, which are now so altered that in many parts it is impossible to name them specifically. They are much changed mineralogically and structurally from their original condition. .The lava flows in the main part of the area were likely of basic to intermediate composition, basalts, andesites, and dacites, now much altered to schist. The flows, of which there is an orderly succession, are thrown into synclinal and anticlinal folds. Rhyolite is a prominent rock in parts of Whitney and Deloro, and the southeast part of Tisdale. Field work in 1922 has shown a strong synclinal structure in the central part of the area; this fold rises towards the west. On the north and south limbs of the fold a succession of lava flows has been recognized. The basin between the limbs is occupied by folded sediments of Temiskaming age. The structure is really a synclinorium with minor anticlines and synclines occurring near the southerly limb. The structure is of great importance since the Dome mine is located along its southerly margin where a deep deposit of conglomerate, greywacké, and slate lies in a synclinal trough of Keewatin rocks.

Field evidence was secured to prove that there had

* Paper read before the Royal Society of Canada, May 1923.
** Department of Mines, Toronto.

Gold Quartz Veins. Dome Mine

been some folding and erosion of the Keewatin prior to the deposition of the Timiskaming sediments. This evidence was based on the recognition of the succession of lava flows with their clear-cut contacts eroded, and sediments deposited across the flow contacts.

The structure of the Keewatin rocks in the vicinity of the Hollinger and McIntyre mines is not yet clearly understood. The presence of infolded Timiskaming sediments three-quarters of a mile west of the Hollinger mine suggests a north-south anticlinal structure

"The Dome" of Gold Quartz

in the area east of the mine from which the Timiskaming sediments have been removed by erosion. The structure of the Keewatin is of importance since some evidence has been obtained by H. S. Robinson, geologist of the McIntyre mine, to indicate gold-bearing veins occurring along lava-flow contacts.

A third series of important rocks is the Algoman. This includes quartz-porphyry, feldspar-porphyry and granite which occur as stocks and dikes intruding the Keewatin and Timiskaming. There is evidence to show that the intrusions of the porphyry were responsible for the gold deposits of Porcupine. It is very significant that all the great mines are located where the older rocks were intruded by the quartz-porphyry. Underground operations have proven the porphyry stocks to pitch in an eastern direction at high angles, 50° or so, at the Hollinger mine, indicating that the porphyry magma rose from some source lying to the east of the present outcrops. The porphyry is a light grey rock in which phenocrysts of quartz are generally recognized, while acid plagioclase is the principal feldspar. Ferromagnesian constituents are usually lacking. The rock is much altered and rendered schistose. Secondary hydrated mica is abundantly present in the altered rock, much of which could be called a sericite schist. The end margins of the elliptically shaped outcrops of porphyry are often very ragged, showing tongues projecting into the volcanic schist. The structure of the masses of porphyry in the Pearl lake area has been worked out by W. H. Wylie and H. S. Robinson, geologists at the Hollinger and McIntyre mines respectively.

Masses of serpentine and dikes of olivine diabase and quartz diabase occur in parts of the area.

Ore Deposits

The gold deposits occur in the Keewatin, Timiskaming and Algoman. Of these the most important at the present time are those in the Keewatin lavas which represent practically all the producing areas of the Hollinger and McIntyre.

The conglomerate and greywacké carry about 90 per cent. of the ore at the Dome mine, with minor quantities in the Keewatin and porphyry.

The mineralization of the deposits is believed to have followed the intrusion of the quartz-porphyry.

The longer axes of the porphyry masses roughly parellel the schistose structure of the volcanic flows and it seems probable that the Keewatin and Timiskaming were partly folded and metamorphosed before the intrusion of the porphyry. The porphyry itself has also been subject to great pressure, being schistose in many of the outcrops.

The intrusion of the porphyry at different horizons produced stresses, which were relieved by the forming of shear zones approximating the direction of schistosity. These shear zones were the loci of the mineral-bearing lodes and replacement deposits.

The deposits are lenticular in shape, such forms being particularly characteristic of those enclosed in schist. In one deposit there may be a series of lenses arranged "en eschelon", constituting a lode. Often, in driving on a lode, it is found that successive lenses lie to the left hand.

The ore deposits of the Pearl lake section can be referred to as a lode system in which there is a series of lodes, or veins, striking from about N.20°.E. at the southwest end of the Hollinger to nearly N.80°E. at the McIntyre, the system having a roughly crescent shaped outline. Branching veins occur with main veins, affording a very complicated series to develop

The Dome Mine in 1910

and stope. Some individual veins have been drifted on for a considerable length. No. 12 vein on the Hollinger was 1,500 feet long on the 200-ft. level, and No. 1. vein at the same mine has a length of about 1,000 feet. No. 5 vein at the McIntyre was 1,500 feet in length. The lodes for this area average about 8 feet in width, although, owing to their lenticular form, stopes are sometimes required as wide as 40 feet in places. Most of the lodes have no definite walls, the limits of a stope being determined by the assay value.

Character of Lodes

The Porcupine deposits, with special reference to the Hollinger-McIntyre area, are, technically speaking, lodes or composite veins, although referred to generally as veins. They consist of mineralized schist with stringers of quartz, or large masses of quartz enclosing strips of altered volcanic rock. The quartz in the deposits is extremely irregular, so that each successive round in drifting on the veins displays a greatly varying distribution of the quartz and schist. The quartz may run with the schist or cut obliquely across it, while streamer-like veinlets may run transversely into the walls. Abrupt bends or folds in a vein usually show a high gold content and much visible gold may be present. The mineralized schist part of a lode usually predominates over the quartz, but some veins are largely quartz, like Nos. 12 and 97 at the Hollinger. The deposit mined at the Porcupine Crown Mine was a much contorted, banded quartz vein.

Relation of Gold Deposits to Porphyry

An examination of the geological map of the Pearl lake section of the area will show numerous masses of porphyry, the largest and most important of which is that which partly underlies Pearl lake and stretches southwesterly on to the Hollinger mine. This stock is about 6,000 feet long and 1,400 feet wide. Most of the ore-bodies at the Hollinger mine are clustered round this stock, the surface plan showing many veins extending beyond its southwesterly outcrop, and lying along or near its flank and that of other smaller masses of porphyry. The westerly end of the large stock, as seen distinctly on the Hollinger property on the surface, is found in its pitch to the east, on the McIntyre on the 1,350-foot level about 300 feet east of the west boundary of the property, opening up an area of volcanic schist favourable to the deposition of gold behind the retreating porphyry. Here a number of gold-bearing veins have been found similar in structure to certain veins which were first encountered in the Hollinger mine at higher levels, or on the surface beyond the porphyry.

Mining operations have shown some gold deposits to occur along fracture zones which have extended from one porphyry stock to another.

While the porphyry is a necessary rock in the formation of the gold deposits, mining operations in the Pearl lake area have proved it to be unfavourable as a container of ore deposits. Profitable veins in the volcanic schist have been found to lose their value or become too low-grade to mine where they enter the porphyry. Veins, which in part of their course lie along the contact of porphyry and volcanic schist, are often favourable for ore. There are also deposits in which a thin strip of mineralized basalt or andesite enclosed within the porphyry walls constitutes a workable vein.

Minerals of the Deposits

The deposits were formed at a period subsequent to the intrusion of the porphyry, the magmatic solutions probably being supplied by a deeper part of the parent magma. The earliest of the minerals is quartz, which in character and structure resembles quartz of pegmatitic origin, showing coarse, granular texture and gas and liquid inclusions. Feldspar frequently accompanies the quartz, being found largely along the contact of quartz and schist. As suggested by Gratton in his description of the veins of the Southern Appalachians, it is possible that the vein-forming solutions representing the final products of emanations of a granite magma were injected under heavy pressure into the surrounding rocks along lines of weakness, and so, like pegmatite dikes, made a space for themselves by opening their own fissures. Such a mode of formation would explain the very irregular forms assumed by the quartz masses in the gold deposits. It is found that the primary quartz is very much shattered and the crushed areas cemented by later quartz and "carbonate." It is usually in these areas that most of the visible gold and sulphides occur.

The most abundant and earliest of the sulphides is iron pyrites, which occurs abundantly in the schist surrounding the quartz masses and to a lesser extent in the quartz. The pyrites is well crystallized in cubic and pyritohedral forms with occasional octahedral faces, particularly in the schist where, with other minerals, it replaces the latter. The crystals of pyrites are generally accompanied by blotches of quartz, sericite and "carbonate" and, occasionally, chlorite. Galena, zinc blende and copper pyrites occur in minor quantity, usually near the contact of the quartz and schist in the quartz or carbonate. In this association of minerals there is frequently visible gold.

Arsenical pyrites and pyrrhotite have been recognized in Hollinger ore, and the rare mineral scheelite, calcium tungstate, is occasionally found in the quartz as an early constituent. Tourmaline is present in many of the deposits, and its bearing on temperature of formation will be referred to later.

The schist ores of the Hollinger-McIntyre system are usually light grey to dark grey in colour, due t abundant carbonate and other secondary minerals. Microscopically they usually show quartz, carbonate, sericite, leucoxene, pyrites, and sometimes chlorite and feldspar in varying proportions. Analyses of mineralized schist from the Hollinger veins have shown an increase of potash and a decrease of soda

The Dome Mine, Today

over that of the unmineralized volcanic rocks of the area. It is suggested that the hot ascending alkaline solutions have replaced the silicates of the rock with sericite, which occurs profusely in a stream-like arrangement of minute blade-like crystals.

Temperature of Formation of the Deposits

Lindgren in his work, Mineral Deposits, groups the Porcupine veins with those deposits that were formed at high temperatures. He states that certain characteristics of the veins resemble those of California which he classifies with deposits formed at intermediate temperatures. High-temperature minerals are not abundant in the Hollinger-McIntyre ores, but tourmaline and pyrrhotite are occasionally seen.

Tourmaline is abundant in some of the Dome ore, particularly from ore- shoot No. 731 and others near the contact with the quartz-porphyry. In ore-shoot No. 731 great masses of conglomerate, greywacké and slate, where lying between two masses of porphyry, have been largely replaced by tourmaline. This ore, which is brown in colour, due to tourmaline, is heavily pyritized, high-grade, and the hardest ore in the camp. Thin sections of porphyry from the vicinity have shown tourmaline as a constituent of the rock, and the tourmaline of the ore has evidently been derived from the porphyry magma.

Pyrrhotite is quite a common mineral in the Dome deposits, usually occurring in fairly large masses with the quartz.

Tourmaline is a characteristic mineral of several gold-bearing quartz veins in the north parts of Whitney and Tisdale township, and a notable constituent of quartz veins in the porphyry on the ridge on which are located the Paymaster and Clifton properties.

Axinite, a boron-bearing silicate, occurs with quartz in veins on the Moneta property.

It is probable that tourmaline in some occurrences is an early constituent along with the quartz, as in vein 44 of the Hollinger. Here the mineral is in glassy quartz, while milky-white quartz carrying pyrite and gold is of later origin.

Dome Mine

The Dome mine differs in geology and structure from the mines near Pearl lake, and requires to be discussed separately. An additional series of rocks, the Timiskaming, is found here. The structure consists of synclinal and anticlinal folds in which a crest line of Keewatin volcanics controls the location of the ore-bodies. The Keewatin crest line outcrops to the west of the large open pit and with a strike N. 60°E pitches at 40° under the conglomerate, greywacké and slate of the Timiskaming series. On the south side of the Keewatin crest there is a deep fold of Timiskaming sediments, the contact dipping almost vertically. On the north side of the Keewatin, the sediments dip gently to the north It is mostly along the crest line, partly in Keewatin, and partly in the sediments, and in the deep sediments to the south of the Keewatin, that the large ore-bodies of the Dome are found. The ore zone on its south side is flanked by intrusions of quartz-porphyry which, on some levels, form a hanging-wall for certain ore deposits. The ore-bodies are large and irregular in outline and are wide in proportion to their stope length. They vary from 15 to 150 feet in width, some being over 500 feet in drift length. Certain shoots have been found to extend vertically for 600 feet. Two stopes were opened up in quartz-porphyry and a few are in the Keewatin , including what is called the telluride stope on the eighth level. About 90 per cent. of the ore has been obtained from conglomerate and greywacké of the Timiskaming series. The ore-shoots are nearly vertical, except when occurring along the crest line of the Keewatin, or when influenced by overlying slates which dip easterly over some of the ore deposits. The slates were too fine-grained for the circulation of ascending solutions and acted as a dam, so that rich ore is often found directly below them. The ore is mineralized schist derived from sediments, Keewatin volcanics, or Algoman porphyry, together with irregular masses or veinlets of quartz. The quartz constitutes probably from 10 to 15 per cent of the ore.

The ore contains a high percentage of sulphide minerals, and usually a high pyrite content indicates an increase in value. There is a great variety of metallic minerals, including pyrite, pyrrhotite, copper pyrites, galena, zinc blende, arsenopyrite, altaite, and a silver-gold telluride. Tourmaline is abundant in certain stopes near the porphyry, while scheelite is occasionally found. The ore contains a good proportion of carbonates. The ore structure has been carefully worked

Lode Structure, McIntyre Mine

out by D. G. H. Wright, geologist of the mine, to whom the writer is indebted for much information.

The main shaft has been sunk to 1,600 feet, while on the 12th level (1,450 feet) development of ore is now in progress.

In 1922, there were milled 365,400 tons and $4,178,[illegible] in gold was produced The recovery was $11.34 per ton with an extraction of 97.8 per cent. The average of the past year apparently shows that the ratio of gold to silver in the ore is 6.7778 to 1. The total fineness of bullion is 983.9 gold and silver.

Development of Mines Near Pearl Lake

The McIntyre mine has the deepest working of a gold mine in the Province. No. 5 shaft is sunk to the 2,450-ft. level, while there are extensive workings on the 1,875-ft. level, particularly on Nos. 7 and 9 veins. No. 6 vein, showing visible gold, was encountered in No. 5 shaft at a depth of 2,150 feet.

During 1922, the McIntyre mine produced $2,137,372 from 217,208 tons of ore, or a recovery of $9.84 per ton.

Mining operations have been carried to the 1,250-ft. level at the Hollinger mine, where the lode system is now being developed. One shaft is down 1,530 feet. In the statement of ore reserves in the annual report of the company for 1922, it is said that 55 veins show values from $32.80 to $6.10 per ton. During the same year nearly 1,500,000 tons were milled with an average value of $8.53, from which $12,274,114 was recovered.

Each of the three large mines has a geological staff whose chief duty is to aid in development by mapping the structure from evidence obtained in drifts, cross-cuts, and other workings, and from examination of diamond drill cores from many parts of the mine. Diamond-drilling is carried on constantly at each property, and has been very effective in locating and following up very irregular ore-shoots. Many short lenses of ore have been discovered by this means that otherwise might have been missed.

MINING IN QUEBEC

By JOHN A. DRESSER*

Viewed broadly, the mining industry in the Province of Quebec, may be said to be long in history, short in production and large in promise. Within the lifetime of the original European inhabitants of Montreal, founded in 1642, iron ores became known and were utilized in the St. Lawrence valley, and within 100 years silver-lead ore on the shore of Lake Temiskaming was indicated by a map of the period published in France. About 1733 the use of the iron ores was so important that a mining company was formed in Quebec to supply the needs of the colony from the bog iron ores of Three Rivers. This operation was carried on more or less continuously until some fifteen or twenty years ago, when the last small blast-furnace of early use was dismantled. There is, of course, no complete record of the production of this small but persistent field, which is now known only as a producer of ochre. Its product was given a place in the literature of the province by the late Dr. W. H. Drummond, poet of Quebec's rural life, in describing the Winter comforts of the "habitants", who reflects on —

"De old stove from Tree River
My wife's fadder geev her
De day we get mariés,
Dat's long time ago—"

Retrospective

In 1824 alluvial gold was found in the pre-Glacial gravels of the Chaudière valley and mining operations were carried on intermittently during the latter half of the last century. A production of $3,000,000. is estimated to have been made from this district, the major portion being recovered from a small area and in about ten years of this time. The engineering difficulties due to deep overburden and water were a serious handicap to the operations of that time. It seems worthy of note that these gravels have not been thoroughly investigated in the light of modern practice.

Copper, known in the province since 1841 at least, was worked vigorously in southern Quebec during the period of the Civil War in the United States. Following the post-war depression several properties were re-opened. One of these, re-opened in 1875 by the late G. H. Nichols, formed the basis of an important sulphuric acid industry. Another, the Eustis mine, near Sherbrooke, has been in practically continuous operation from 1880 to the present time. It is the deepest metal mine in Canada, being well over 4,000 feet. Records of the total production of copper in Quebec are not available. In 1918, the high mark of the Great War period, the output was 5,869,000 lbs. The ores are sulphides, principally chalcopyrite, and occur mainly in sheared porphyry and related volcanic rocks. Pyrite has been an important by-product of these operations. It was in the early development of these ores that the late James Douglas began his brilliant career in copper metallurgy.

Chromite, previously known for some years, was first exploited in Quebec in 1861, the ore being exported to Scotland. The venture proved unprofitable. Since 1894, however, chromite has been mined in irregular quantities but almost continuously under the stimulus of better railway facilities. The total production has been approximately 200,000 tons.

Phosphate was mined in the western part of the province in the valley of the Ottawa River from the year 1877, until displaced in the market by the more readily available deposits of the southern Appalachian States. Exports from the province of Quebec for the thirty years following 1877 amounted to 270,000 tons.

Graphite has been mined intermittently in the Ottawa valley in Quebec since 1846. The total production is not known; that from 1898 to 1918 was valued at $386,540.

Mica is mined in various parts of the pre-Cambrian area of Quebec, principally in the vicinity of the Gatineau and Lièvre rivers, tributaries of the Ottawa. The chief product is phlogopite or amber mica. In 1913 the production amounted to 626 tons valued at $125,488; last year to 444½ tons, valued at $90,518.

Asbestos. —When one speaks of mining in Quebec he is supposed to refer to asbestos, unless he specifies otherwise. Although discovered in 1847, it was not commercially developed until thirty years later, when the construction of the Quebec Central Railway to the field was accomplished. Since the latter date it has grown to dominating importance in the mining industry of the province, and for the past thirty years the major supply of the world has come from Quebec. Its excellent quality, large reserves and favorable transportation facilities have resulted in a large and stable development. The maximum production, attained in 1920, amounted to nearly 200,000 tons having a value in round figures of $15,000,000. Asbestos is the subject of a separate article in the present issue of the *Journal,* from the authoritative pen of Mr. Norman R. Fisher, and need not, therefore, be further discussed here.

Magnesite, molybdenite, zinc and lead are minerals that attained a production of commercial importance in Quebec during the war and more recently. Feldspar has been making recently a sensible output.

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President, Canadian Institute of Mining of Metallurgy.

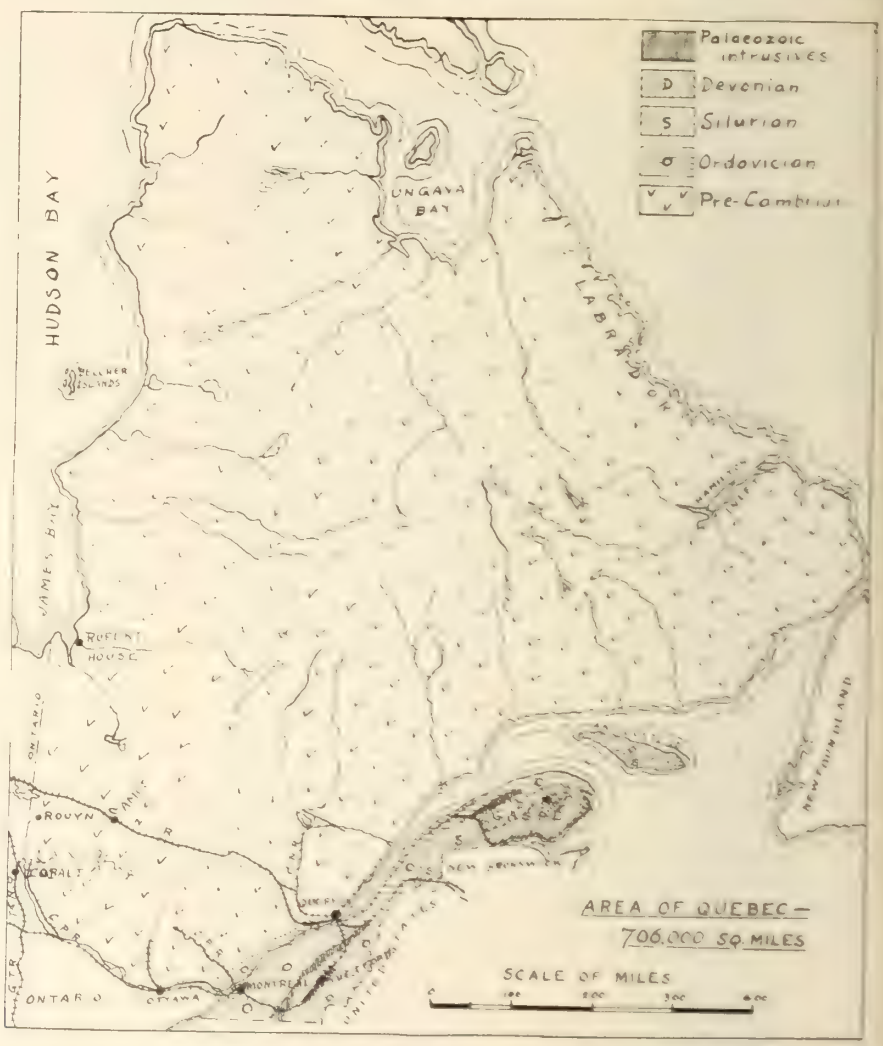
Prospective

Notwithstanding its long and rather commonplace history, the mining industry of Quebec has decidedly promising prospects for early future development.

On the south side of the St. Lawrence river there is a large tract in the Gaspé peninsula which gives promise of repeating the values already known, and in part obtained, from the same formations in the more southerly part of the province. A large area in this region is now being developed for zinc, lead and copper, with strong hopes of success.

Petroleum occurs in the Devonian measures of Gaspé and may yet be found in useful quantities in the less disturbed Paleozoic strata of this region, or in the Island of Anticosti. Alluvial gold in the Chaudière and Ditton valley has been already referred to and is not without prospective value.

Only a small corner of Quebec Province is served by railways. The Ungava Peninsula has been traversed only at wide intervals, yet large areas of the mineral-bearing series of rocks have been located roughly. Little prospecting has been done, even on the coasts of the peninsula. The interior of Gaspé is almost unknown to the prospector



North of the St. Lawrence River, the Province of Quebec consists mainly of a portion of the Laurentian Plateau, or "Canadian Shield". The major portion of this region is, of course, little known as to its mineral products, save that it is underlain by rocks of pre-Cambrian age which in neighboring Provinces and States, and as far as is known in Quebec also, contain a wide range of useful minerals. The total area of pre-Cambrian formation in Quebec is about 600,000 square miles. Speaking of all this region, Mr. T. C. Denis, Superintendent of Mines for Quebec, has recently observed that its productiveness is in general proportion to our knowledge of its resources, that is to say, to its settlement. Aside from such resources as have been mentioned as occurring within this settled part of the Province, it is significant and encouraging to recall the production that has been made from the pre-Cambrian rocks of the older settled regions of New York, Michigan, Wisconsin, Minnesota and Ontario. Of these the most generally applicable comparison is to be made with the Province of Ontario, whose better exploration and development have shown immense resources in territory of similar character and adjacent to the Province of Quebec.

Besides the extraordinary deposits of Sudbury and Cobalt, the annual production of gold ore from Ontario is rapidly reaching preponderant proportions. Yet some sixteen or seventeen years ago a geologist setting out on a prospecting expedition to the North was directed by his principals to spend no time in the search for gold, since an eminent financier, still prominent in the country, had fully assured himself that there was no gold of importance in Ontario or Quebec. Since that date a small corner of Northeastern Ontario has produced nearly $100,000,000 in gold, and has repaid more than a quarter of that amount in dividends. In view of the splendid success of that Province in recent years, the hope that the closely related province of Quebec may develop a large mining industry seems well founded.

It would be difficult to over-estimate the value to this province of the experience gained by the province of Ontario in the development of its mining industry. The successful utilization of its mineral resources seems to be due in large measure to two features in the policy of the Province.

The building of the Temiskaming and Northern On-

tario Railway, twenty years ago, into the then little known North, has added to the province an immense mineral production as well as a large and profitable agricultural region.

Concurrently with this exploratory venture the Province of Ontario built up a Bureau, now a Department, of Mines, of the highest efficiency in guiding the utilization and adding to the discovery of mineral resources. The work of this Department has been expanded as the need, or rather as the opportunity, for service arose. The contributions made by it to the mining industry are of the first order, and its reports are a necessary part of the equipment of all workers in similar fields throughout the world. The administration of mining lands so as to facilitate their development and give due returns to the Province has been done with equal distinction.

There is now opportunity for Quebec to supplement, as well as to profit by, the results of this commendable policy. In transportation facilities, water power, timber and other supplies for mining equipment Quebec is favorably circumstanced. The Canadian National Railway between Cochrane and Quebec opens a section of some 500 miles along its course, and also affords access to many navigable rivers that extend far into the interior. The Canadian Pacific Railway is building an extension of its line on the East side of Lake Temiskaming to the Quinze River, on which are a series of notable water falls, and soon will be in a position to serve the new prospecting district of the Province.

The water powers of the Province are on a large scale and powers either developed or undeveloped occur within transmissible distances in any part of the province. Timber is everywhere available for mining purposes, and the rapid settlement of agricultural lands in newer portions of the province assures moderate living costs, and in many places local supplies of labor.

The Department of Mines of the Province of Quebec is an admirably efficient office in all but its size, which is totally inadequate. Previous to 1909 its work was only on a nominal scale. Following a well directed enlargement at that time, the mining laws were brought into harmony with those of other mining provinces, and reports of a superior character have ever since been produced. But although the mineral production of that time was less than $6,000,000 and has now risen to $18,000,000 or $20,000,000, there has been no enlargement of this Bureau to correspond to the increased needs, nor in fact any fundamental enlargement at all. One deputy recording office has been opened recently at Ville Marie, in the West end of the Province, but the Department is not equipped either for adequate inspection of mining operations, or for exploration of new areas. In fact it must under these circumstances merely record mining operations, or for exploration of new areas. The efficiency of its work, however, when these limiting circumstances are considered, is really remarkable. But the Department must be substantially enlarged, more especially in its technical staff, before the Province of Quebec can avail itself of the enlarged opportunity now before it.

Gold in Northwestern Quebec

By A. O. DUFRESNE*

From lake Temiscamingue extending north to James Bay is a vast stretch of flat country that has been described as the "Abitibi Clay Belt". It is a plateau of post-glacial clays, extending approximately as far as Bell river to the east, and on the south to the divide between the Hudson Bay slope and the St-Lawrence river basin. This plateau, which extends on both sides of the Ontario-Quebec boundary, is mostly underlain by pre-Cambrian rocks consisting of Keewatin volcanics, Temiscamingue and Cobalt sediments, and igneous rocks of intermediate and subsequent epochs. The rocks of this system are known to contain elsewhere rich deposits of the precious metals.

The results of geological explorations in Northwestern Quebec have brought to light the extension, into that section of the Province, of belts of rock favourable in Ontario to the occurrence of gold.

It is only within the last twenty years, after the discovery of the spectacular silver deposits of Cobalt that mining men have turned to the Hudson Bay slope as a field for mineral exploration. Since then, every summer, hundreds of prospectors have travelled by canoe the numerous lakes and rivers of the northern watershed. Railroad facilities offered by the T. & N O. Ry. and later by the National Transcontinental Ry., and the help of the Provincial geologists in promptly mapping and reporting on the areas of new discoveries, have attracted to Ontario a large number of able prospectors. Their searches have borne fruit; already a score of gold producers have been developed. Previous to 1912 the gold production of Ontario was below the $100,000 mark, while last year the mines of Porcupine and Kirkland Lake yielded $20,000,000 of the precious metal.

The discovery of rich ore-bodies in these two camps and of important occurrences at a number of other places have prompted mining men to examine similar formations extending east of the interprovincial boundary into Northwestern Quebec. The accumulation of geological data in the gold areas of Ontario and the exploratory mapping of geological formations in the adjoining sections of Quebec have brought forth evidences of the occurrence in Northwestern Quebec of a gold-bearing zone probably of economic importance,

Workings on the Powell Vein, Rouyn Township

* Assistant Superintendent of Mines, Quebec.

following the trend of the belt of Temiscamingue sediments on which are located the Matachewan, the Kirkland Lake and the Larder Lake gold areas. This belt of Temiscamingue sediments can be traced east of the interprovincial boundary into Quebec over a distance of 120 miles, paralleling to the south the northernmost transcontinental line of the Canadian National Railway.

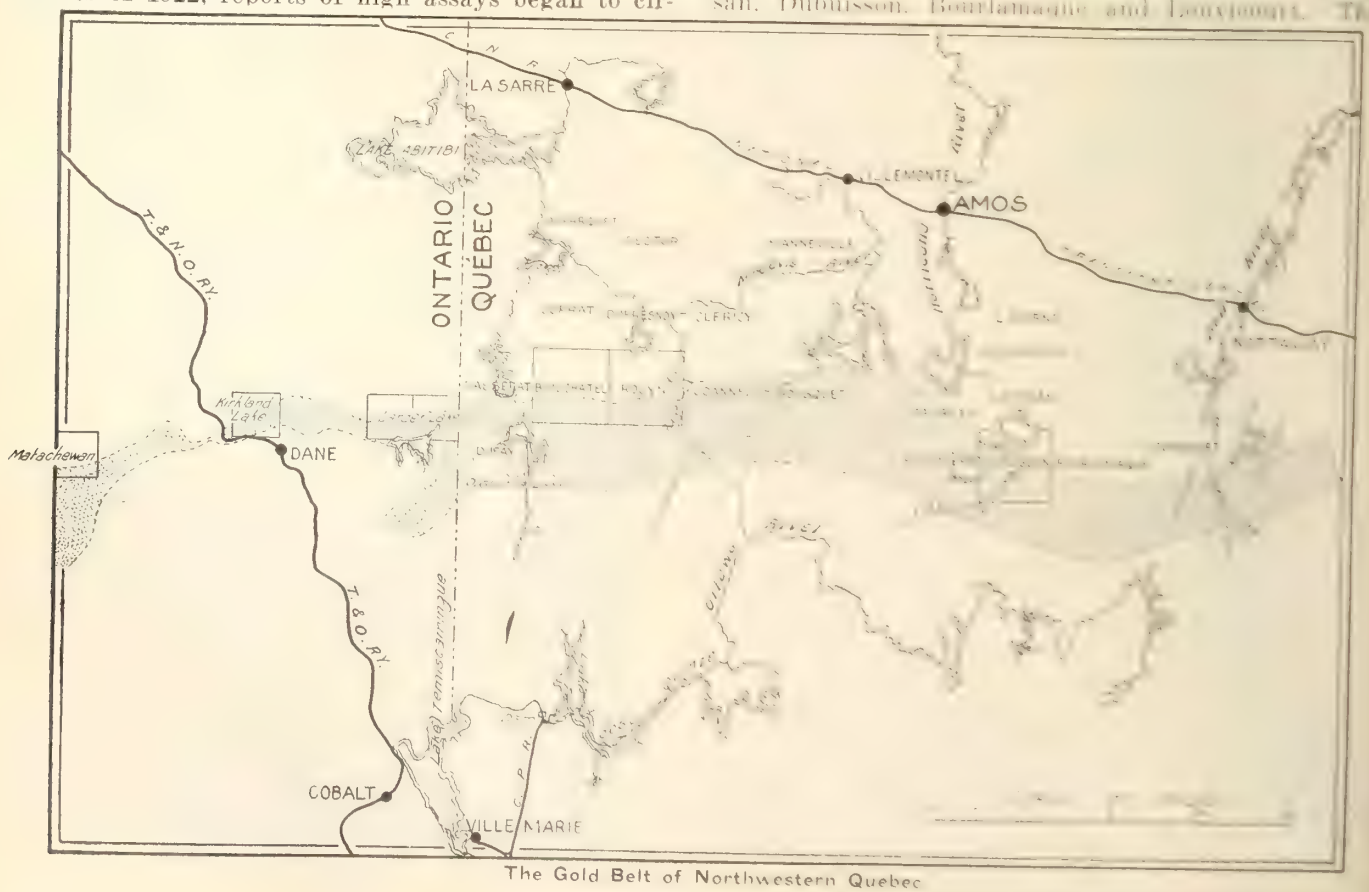
Camp of Noranda Mines, Ltd. on Héré Lake
Rouyn Township

Previous to last year native gold had been found in two places along this belt: in 1906 on Lake Fortune in Boischatel township and in 1911 in Dubuisson township. At these two places shallow pits and surface trenching were the only development work done until last winter, when more extensive exploratory work was performed. During the last twelve months Rouyn township has been the scene of much prospecting activity. The first claim recorded in Rouyn was staked on the 11th of September, 1920, in the name of E. J. Miller. In May of the following year E. H. Horne staked west and south of the above claim. In the summer of 1922, reports of high assays began to circulate and the few with "inside" information staked claims in adjoining sections, mostly in the northwestern corner of the township. By the end of the winter nearly the whole of the township had been staked, as well as large sections of adjoining townships.

On the 1st of July, 1923, the number of claims recorded was 975, covering an area of 175,000 acres in the townships of Hébécourt, Duparquet, Destor, Montbray, Duprat, Dufresnoy, Clérioy, Dasserat, Boischâtel, Rouyn, Joannès, Dufay, Montbeillard and Bellecombe. A part of this acreage has been transferred by claim holders to syndicates and to companies recently incorporated; amongst these are the following:—

Amulet Gold Mines Ltd.
Argonaut Gold Ltd.
Boischâtel Mining Syndicate
The Chance Syndicate.
Crown Reserve Mining Co. Ltd.
Dasserat-Rouyn Goldfields Ltd.
Gold Belt Company.
The Lake Fortune Mining Co. Ltd.
The Larose Mines Ltd.
Lyman-Quebec Exploration Syndicate.
Montreal-Rouyn Mines Ltd.
Noranda Mines Ltd.
M. J. O'Brien Ltd.
Pontiac Syndicate.
Rouyn Gold Mines Ltd.

Besides the above townships, other prospecting centers have developed and other groups of claims have been taken up along this same belt of Temiscamingue rocks. In all some 150 claims, of a total area of 15,000 acres, have been recorded during the year, mostly in the townships of Villemontel, Malartic, Fournière, Varsan, Dubuisson, Bourlamaque and Louvicourt. The



The Gold Belt of Northwestern Quebec

aurentian Gold Mines Ltd., Nepawa Development Syn-icate, Quebec Gold Rand Ltd., Stabell Gold Mines, Jnion Mining Corporation Ltd., have been organized o take up some of these claims.

The activities in Rouyn township are what attracted ately the attention of the mining community, owing o the fact that a considerable amount of work has al-eady been done, including several thousand feet of liamond drilling. Systematic prospecting and develop-nent work is being carried on in several places, as he accompanying photographs will prove, and the esults of sampling on a large scale are said to be con-sistent and quite satisfactory. However, the Rouyn listrict is not a poor man's camp, inasmuch as over-burden covers most of the ground and often is heavy. This makes prospecting difficult, both financially and physically, and if to this is added the remoteness of the region from the railway, and the consequent high cost of transportation of supplies and machinery, it will be realized that only strongly backed organizations are able to do more than the mere assessment work. On this account the development of the district as a gold producer may be slow, and it is possible that several years may elapse before the first gold brick from Rouyn is sent to the Mint. But there is no doubt that the gold is there. The favourable geological associations — Cobalt and Temiscamingue sediments, Keewatin volcanics, cut and invaded by gabbros, granites, syenites, rhyolites and above all by various of the much-sought-for porphyries — can be observed and recognized without any break from west of Matachewan, through Kirkland, Larder, Boischâtel, Rouyn, Dubuisson, Louvicourt, to the east of the headwaters of the Bell river.

Three geological parties sent in by the Federal Department of Mines, under Dr. H. C. Cooke, Dr. R. Harvie and Dr. W. F. James respectively are working out the details of the geology and mapping the rocks. The result of their work will be awaited with eagerness by the prospectors interested in Northwestern Quebec.

The Quebec Asbestos Industry

A General Description

By NORMAN R. FISHER*

The asbestos producing region of Canada, world famous because of the quality and quantity of the asbestos it produces, is centered in the Eastern Townships of the Province of Quebec, along a stretch of high ground known as the Notre Dame Hills, the extension in Canada of the Green Mountains of Vermont State. This high ground follows right through to the Gaspé Peninsula on the St. Lawrence and outcrops of serpentine following the same line of strike are to be found every here and there along it; but only in one section of it about 70 miles long, lying between the towns of Danville and East Broughton, does this serpentine contain asbestos in sufficient quantity or under sufficiently advantageous circumstances to justify its exploitation. Within this section there are present six producing centres, generally designated as the East Broughton, the Robertson, the Thetford, the Black Lake, the Coleraine and the Danville areas, and in each of these one or more mines are now being operated on a considerable scale.

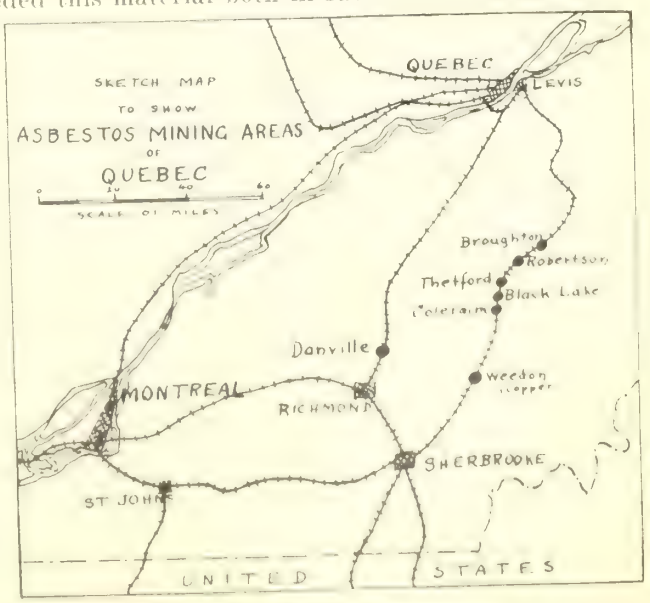
The asbestos produced in these several areas is all of the same chrysotile variety, the fibrous form of the serpentine itself, but varies considerably in quality. Each quality has, however, its particular advantages for certain manufacturing purposes; but that more desirable for spinning, which calls for the highest quality material, is almost altogether found in the Thetford area, where the asbestos is generally conceded to be the finest of its kind not only in this Province, but in any part of the world in which it is at present being produced in commercial quantity.

Johnson's Mine — the Pioneer Pit

Though the occurrence of asbestos in this section was known to the Geological Survey of Canada many years before, its actual exploitation commenced only in 1878 as a consequence of the construction of the Quebec Central Railway through the district, and even then only in a very small way. In that year, Mr. Andrew Johnson, still living in Thetford Mines and still an active operating member of the industry, made the first attempt at producing asbestos on a commercial scale, when he started a small quarry on lot 27, range 6, of the Township of Thetford within a short distance of the present Thetford Mines railway station. This small undertaking later blossomed into a large and profitable mine, later known as the Johnson's Mine, which is in active operation at the present day.

About the same time work was also commenced on an adjoining property, now known as the Bell Mine, and in the following year the King Brothers, prominent lumbermen of the district at that time, commenced opening up another outcrop close by, later to become the well known King Mine of the Asbestos Corporation of Canada.

The larger part of this went to England to be sold in competition with the Italian product then principally used, and as it proved to be of much better quality, especially for spinning purposess, it soon superseded this material both in favor and demand.



*Manager, Consolidated Asbestos, Limited, Thetford, Que.

Whether the discovery and exploitation of the Canadian asbestos at this time was instrumental in promoting the progress of the asbestos manufacturing industry, which was then only in its infancy, it is hard now to say; yet the fact remains that from then on it grew rapidly, and along with it an ever increasing demand for the Canadian product. As a consequence, the mining of asbestos in the Province of Quebec soon became an established industry, and the success of its pioneers in the vicinity of Thetford Mines induced intensive prospecting elsewhere along the serpentine belt for other occurrences of moment, with the result that within the next few years many other properties were opened up between Danville and East Broughton, several to become eventually permanently established and to continue as large producers to the present day.

Cableway Derricks at an Asbestos Pit

Milling Commenced

In the early days of the industry only the vein matter known as "crude" was recovered, this being merely hand-cobbed from the quarried rock and afterwards sorted into two or three grades according to its length and quality; and even to this day more or less the same practice is in vogue for the recovery of the longer "crude" content of the rock. Later, successful steps were taken to discover some satisfactory mechanical method by which the rock could be treated for the recovery of the balance of its asbestos content. In the course of time the method then evolved was improved upon considerably, but solely in the manner of its application, not in principle. Today there are numerous mills in active operation throughout the field, some of very large capacity, provided with as modern and efficient equipment of its kind as can be seen anywhere. Very few of these mills are working today at full capacity, yet together they are treating at the rate of about three million tons annually, for an average recovery of about 6 per cent in the form of what is known as "mill fibre."

This mill fibre, because of its comparative shortness and its more or less bruised condition consequent upon the hard treatment it has received in the course of its recovery, naturally is, for the most part, not nearly so valuable as the crude recovered by hand; yet in most instances it is now the main source of revenue.

Production Record

The accompanying table, compiled mainly from official statistics, shows the annual output of asbestos, including both crude and mill fibre, from the mines of the Province of Quebec since the inception of the industry in 1878 up to the end of last year, and is interesting as showing not only the great growth of the industry during this time, but more particularly the gradual increase, indicative of its stability. It also shows that the banner year of the industry was in 1920, when there was shipped from the various mines 179,891 tons of crude and fibre of a total value of $14,749,048 or an average value of $81.99 per ton, the highest average since 1891, when only crude was produced.

These high figures were, of course, in no small measure due to the universally prosperous industrial conditions and inflated prices of the immediate post-war period and were consequently abnormal. However, when the reaction set in the following year and deflation accompanied by great industrial depression prevailed on all sides, the asbestos industry was hit much harder than would ordinarily have been expected. In that year alone not only did shipments drop to around 50 per cent. of what they had been during the previous year, but the value per ton of what was shipped dropped over 25 per cent. Then, to make matters worse, the break in prices did not stop, for though in the following year, 1922, there was a marked recovery in demand, there being shipped from the mines in that period some 160,339 tons or the second highest quantity in the history of the industry, unfortunately the prices obtaining still continued to drop till they averaged only some $37.75 per ton for the year as compared with $81.99 per ton that ruled but two years before. The

Steam Shovel in Asbestos Pit

Glory-holes, Leading to Underground Mine Workings

higher priced crudes were naturally hit hardest, No. 1 Crude, which in 1920 was selling at around $2,500 per ton, dropping in value in 1922 to around $500 per ton, while many of the other grades suffered in proportion almost as badly.

Price-Cutting Followed the Slump

This unfortunate condition of affairs was not alone due to the general price deflation of the period but also in great measure to the price-cutting war amongst the producers themselves, induced by a too limited market, made still narrower by the smallness of the European demand, now shrunk almost to insignificance through the lack of purchasing power of Germany and Austria though but a few years before they absorbed in the vicinity of 80 per cent. of Canada's whole output.

This competition for what business remained was both foreign and local in character, the foreign competition being in long stuffs, principally the product of South Africa, which during the past few years has become a vital factor in the industry through its cheap production of an excellent quality of chrysotile crude, whilst the local competition was for the most part in short stuffs of which there was being produced by the mines much more than the market could absorb; and unfortunately there existed no coöperative arrangement amongst producers to counteract the tendency to excessive price-cutting.

Table of Annual Production of Asbestos Crude and Fibre in the Province of Quebec since the beginning of the Industry

Year	Tonnage Produced	Total Value	Average Value Per Ton
1878	50	.....	....
1879	300	19,500	65.00
1880	380	24,700	65.00
1881	540	35,100	65.00
1882	810	52,650	65.00
1883	955	68,750	72.00
1884	1,141	75,097	65.81
1885	2,440	142,441	58.37
1886	3,458	206,251	59.65
1887	4,619	226,976	49.55
1888	4,404	255,007	57.90
1889	6,113	426,554	69.77
1890	9,860	1,270,240	128.82
1891	9,279	999,878	107.75
1892	6,082	390,462	64.16
1893	6,331	310,156	48.99
1894	7,630	420,825	55.15
1895	8,756	368,175	42.04
1896	10,892	423,066	38.84
1897	13,202	399,528	30.26
1898	15,893	496,340	31.23
1899	15,571	581,667	37.36
1900	21,408	719,416	33.60
1901	33,466	1,274,315	38.70
1902	30,634	1,161,870	37.92
1903	29,261	916,970	31.94
1904	35,479	1,186,970	33.43
1905	48,960	1,476,450	30.16
1906	61,675	2,143,653	34.76
1907	61,985	2,455,919	39.62
1908	65,157	2,551,596	39.16
1909	64,965	2,296,584	35.35
1910	80,605	2,667,829	33.10
1911	102,224	3,026,306	29.60
1912	111,175	3,059,084	27.52
1913	136,609	3,830,504	28.04
1914	107,401	2,895,935	26.96
1915	113,115	3,544,362	31.34
1916	133,339	5,182,905	38.87
1917	137,242	7,198,558	52.45
1918	142,375	9,019,899	63.35
1919	135,862	10,932,289	80.47
1920	179,891	14,749,048	81.99
1921	87,475	5,199,789	59.44
1922	160,339	6,053,068	37.75
Total	2,209,368	$100,741,932	$45.60

The Occurrence of Asbestos

The geology of the asbestos-producing region of Quebec has been so thoroughly and well described in the various Government reports published from time to time that it would be superfluous to discuss it further here except in a very general way. Suffice it therefore, to say that the asbestos bearing serpentine occurs as part of a great belt of basic intrusive rocks stretching in a northeasterly direction for several hundred miles from the State of Vermont right through to the St. Lawrence via Gaspé Peninsula. Though in this particular belt serpentine is found exposed only in comparatively limited areas and intermittently throughout its length, it is nevertheless its chief economic component, and this solely accounts for the fact that the whole of it is now generally known and referred to as the "Serpentine Belt."

It has not yet been definitely established in what form this igneous belt intrudes the ancient rocks, for the most part metamorphosed sedimentaries, that enclose it; but judging from its occurrence in the Thetford, Black Lake and Coleraine areas, where it is exposed for a considerable area and where more detailed information is available concerning it than elsewhere, it would appear to occur in the form of a sill some 2,000 feet thick that has been folded steeply on a N. E.-S. W. direction.

The "Slip Fibre" Area

The serpentine of this particular area, and in fact

Stope in an Asbestos Mine

of the greater part of the belt, is massive in character and contains many acid inclusions both small and large, of a material, colloquially known as "granite" though it is really for the most part aplite that has apparently segregated from the original magma during the last phase of its cooling; but there is also another apparently quite distinct body of it, also of considerable economic importance, that is quite schistose in character and contains no such acid inclusions. This latter rock lies in a part of the Belt about 12 miles long in and between the East Broughton and Robertson areas, and a little to the north of the main body, and is, comparatively speaking, quite narrow, being at most only some 300 feet wide. It is much lighter in color and more talcy to the feel than the general run of the serpentine and contains most of its asbestos in

Cobbing "Crude" in a Stope

the form of what is known as "slip fibre" instead of the usual "cross fibre" variety of the massive serpentine.

This slip fibre is a friction product that occurs along, and more or less parallel to, the cleavage or shear planes of the serpentine of which it is merely an alteration product formed subsequent to its solidification, whereas the cross fibre variety is a solution product that occurs in the joint planes of the serpentine and was apparently formed contemporaneously with its solidification.

The slip fibre section of the Serpentine Belt is much more regular in its fibre content than is the cross fibre section, and on the whole it carries a higher proportion of recoverable fibre. The explanation of this is that while with the former the asbestos is disseminated fairly uniformly throughout the whole mass as a result of the general nature of its structural metamorphism, it occurs in the latter for the most part merely as veins, either scattered throughout it sporadically or segregated into net-works or systems of parallel veins to form enriched zones or masses, while the intervening rock often contains little or no asbestos at all, when it is known colloquially as "dry rock."

Characteristics of the Asbestos

The asbestos produced throughout the Belt is all practically the same throughout mineralogically, but varies considerably from place to place in its physical characteristics. At times it is white in color, quite soft and talcy to the feel and low in tensile strength, while again it is of a soiled, dark color, quite harsh to the feel and rather brittle; but in the Thetford area proper, where the best quality of asbestos is found, it feels and looks, when carefully distintegrated, for all the world like the finest quality of silk and can almost as readily be spun into fine yarn of considerable tensile strength. A general average analysis would approximate the following:—

Silica	40%
Magnesia	40%
Water	14%
Alumina	2%
Iron	4%
	100%

When heated, its combined water is given off slowly until a temperature of about 450 degrees C. is reached but above this it comes off readily, and the more it is driven off, the more harsh and brittle does the material become and the more does it lose in tensile strength. Its fusion point is in the vicinity of 1,530 degrees C.

Original Mining Methods

All the deposits of asbestos now being mined outcropped originally as pay ore and consequently were originally attacked directly at the surface by various open-cast methods of mining.

In some places it was possible for a time to quarry directly into the side of hills and other prominences containing the asbestos, but oftener it was found necessary to commence sinking from the start and to carry on, on a small scale, the same kind of open-cast mining now being conducted on a huge scale at many properties with great open workings several hundred feet in diameter and up to 350 feet deep.

Originally, when the pits were small, ordinary boom derricks operated by hand or horse power were used to lift the broken rock to the surface, but as they increased in dimensions and such primitive appliances became impracticable, cableway derricks were installed and steam, and later electric, hoists were introduced in order that the broken rock might be more expeditiously and economically disposed of. This was done in boxes of 1 to 1½ tons capacity, which were filled by hand at convenient points within the range of the cableway and then hauled to the surface to be dumped into waiting cars, bins or pan conveyors.

Cableway Derricks

As the pits were gradually extended laterally, additional cableway derricks had to be installed, until at times there were as many as ten or more of them installed along one great opening. As the lateral

Electric Underground Haulage

mits of these pits were reached and the convergence of the pit walls at depth ultimately rendered the further use of existing equipment impracticable, other methods of attack had to be sought and adopted. At the King Mine at Thetford Mines, an elaboration of the cableway derrick system was adopted, and by the use of much heavier equipment, derricks were installed having a span in the neighbourhood of 1,000 feet, which enabled the pit to be widened commensurately and at the same time carried to a much greater depth. This installation is undoubtedly one of the most elaborate of its kind in existence, and with the six derricks now in operation it is possible, under ideal conditions and with sufficient loaders available, to handle, with the 5-ton boxes in use, upwards of 300 tons an hour.

Travelling Cranes in Pits

At other properties, such as the Bell Mine at Thetford, faced with the same problem, a less elaborate yet quite as efficient method was adopted in the shape of travelling cranes operating on the pit bottom, which lift and dump the boxes as they are loaded by hand into 30-ton cars which are drawn direct to the surface crusher house up a haulage way with a 1 in 10 grade. This system is undoubtedly the essence of simplicity and cheapness for the particular method of mining practised, but, like other similar open-cast methods, it has its limitations in depth.

Similar practice to this is in use at several other properties in the district, while at others the only difference is that, instead of man-handling all the rock into boxes, it is excavated and delivered direct to the cars by means of steam shovels. At Danville this system is in use on a large scale with several shovels in operation. At the Vimy Ridge Mine of the Bennett-Martin Company it is practised under the unusually advantageous conditions of a hill-side operation. In the slip fibre belt its use is almost universal.

Steam Shovels

The steam-shovel method is undoubtedly the cheapest of all from the cost-per-ton point of view; but where the rock contains a considerable proportion of crude, as it does in the Thetford District, it is considered to be more profitable in the long run to man-handle all the rock into boxes so that a better extraction of the crude may be made during the process of loading. This practice also permits of an efficient separation being made at the loading stage of any associated "granite" and "dry rock" the deposit may contain, the latter being eliminated in this manner at some mines to the extent of upwards of 50 per cent. of the total rock mined.

Underground Mining

At the Thetford Mine of the Consolidated Asbestos Limited, none of the above methods were practicable, owing to boundary and other limitations, so that when the cable-way derrick system became impracticable, it was decided to attack the deposit by underground methods. A large three-compartment shaft was sunk to a depth of 520 feet and the deposit opened up from this by an elaborate system of tunnelling at depths of 200 and 375 feet from the surface, preparatory to mining it concurrently from both levels. At the junction of these levels with the shaft, large storage pockets are provided to receive the ore, which is hauled to them in trains of four 5-ton cars by storage battery locomotives. From these pockets the ore is drawn as required and raised to the surface in two 4-ton self dumping skips for storage. Each of these levels is also connected to the surface by an inclined double-track haulage way with a grade of 1 in 3, through which the underground cars may alternatively be drawn direct to the surface to deliver ore direct to the crusher house, or to take any barren rock or overburden direct to the dump.

The methods of mining in use are shrinkage stoping and glory-holing, or a combination of the two. At certain points advantageous for glory-holding, raises are run to the surface, and after any overburden in

Hoisting Ore from an Asbestos Pit

their vicinity has been disposed of through them, all the ore within their reach is shot down.

At other points in the deposit where stoping is more practicable, large 35-foot wide stopes have been developed. These are arranged in parallel with 40-foot pillars. No timbering whatever is necessary, as suitable horizontal pillars about 15 feet thick, pierced about every 20 feet for 5-foot wide loading chutes, are left above the drifts. As these stopes break through to the surface they become automatically great, elongated glory-holes into which the dividing walls or pillars are broken from the surface down.

Open Pit vs. Underground Mining

Without going into the controversial question of comparative costs, it might be said that this method of mining has many obvious advantages over any open cast method, more particularly as operations can be carried on without interruption during any kind of weather, a very important feature in such a climate as Canada's. It permits also of a considerable broken ore reserve being provided to regulate output, and of selective mining being more readily applied to control the grade treated. It is true that in this method the recovery of crude cannot be made so well directly the rock is broken as is possible with open cast methods where every ounce of rock is man-handled; but with the arrangements provided to meet this factor the ultimate recovery is every whit as good, if not better, by underground methods.

To attain this, not only is all the broken rock, both of the glory hole and stope workings, hand picked and cobbed for its crude contents, just as is done ordinarily in the pits, but it is given later a further close scrutiny as it passes over a system of picking belts provided for the purpose immediately following the primary crushers.

Crude Recovery and Preparation

The most valuable of the asbestos is the "crude." This varies considerably, both in quality and quantity, at the various pits, and in the same pit, some of it being too "lifeless" and weak to be suitable for the spinning which is its principal use, while more of it is too harsh and brittle for any such purpose.

Though crude suitable for spinning is to be found at many points throughout the Serpentine Belt, by far the most desirable for such a purpose is that recovered from the mines in the immediate vicinity of Thetford Mines, because of its exceptional fineness, flexibility and tensile strength. The veins in which it occurs vary from a fraction of an inch in width up to as much as 6 or 7 inches wide, but seldom are they over two inches wide. Only veins of ½ in. or more in width are, however, gathered by the hand picking and cobbing methods in use, and after drying on steam-heated grids it is carefully overhauled by the boys or girls under expert supervision and sorted into grades for the market. At present only two grades are made, commonly known as the No. 1 and No. 2 of the particular mines producing them. The No. 1 is the select part of the material and measures ½ inch or more in length, while the No. 2 is the discard from this after all rock matter has been removed and after it has been screened over a 4-mesh screen to remove the shorts.

The recovery of crude per ton of rock mined varies considerably, not only throughout the district generally, but at each mine. The percentage in the richer patches or zones is, of course, at times exceptionally high; but the amount recovered in terms of the total rock mined averages only from 0.15 to 0.25 per cent at properties regularly by producing crude.

Milling Methods

The object of the milling is to liberate as much as possible of the asbestos content of the rock not readily removable by hand, with the least possible separating and bruising of the resulting fibres. The existing practice is to crush the rock only sufficiently to enable special fiberizing machines to liberate its fibre content and then to extract the fibre from the rock by means of suction suitably applied.

Before the asbestos industry came into its own, lumbering was the chief industry of the district, and it is interesting to note that even to this day the hand of the lumberman can be seen in the method that was developed to recover the asbestos from its mother rock. In those days, as now, it was the practice of the lumbermen to dispose of the shavings and sawdust from their saw-mills by a system of suction from fans and to collect it in separators, and it was the happy thought of someone familiar with this practice to use it to recover the fiberized asbestos from the rock after it had been freed by some machine adapted to the purpose. This idea, once properly worked out and applied, proved to be a decided success, and though other methods, both dry and wet, have been suggested and experimented with from time to time, they are merely elaborations of this original idea, in general use to this day in all the mills. The crushing, drying and fiberizing equipment of the mills is as large and as efficient as will be found anywhere.

The practice followed by all is, in the main, the same and may be classified under the following heads:

1.—Coarse Crushing.
2.—Drying.
3.—Fine Crushing and Fiberizing.
4.—Extraction of the Fibre.
5.—Grading.

Coarse Crushing

The size of the primary crushers varies considerably throughout the field, as it is governed not only by the capacity required but by the size of the material to be delivered to them, which varies at each mine according to the method of mining used. At the Johns-Manville mine at Danville, for instance, where large capacity shovels are used, it is considered desirable to use crushers capable of taking care, when necessary, of quite large blocks of rock, so 48" x 60" sectional jaw crushers have been adopted. At Thetford Mines, where most of the broken rock has to be man-handled before reaching the crushers and therefore contains but few pieces of much size, 24" x 36" jaw crushers are for the most part found quite adequate, though a 36" x 48" size is preferred by some.

The jaw type of crusher is almost universally preferred for the primary crushing in this field, only one or two of the mines using gyratories for the purpose.

Following the primary crushing it is the practice of one of the mines, with highly satisfactory result, to pass all crushed rock over picking belts in order to sort from it whatever crude, barren rock and foreign matter can be conveniently and economically removed in this way before it passes to the mill.

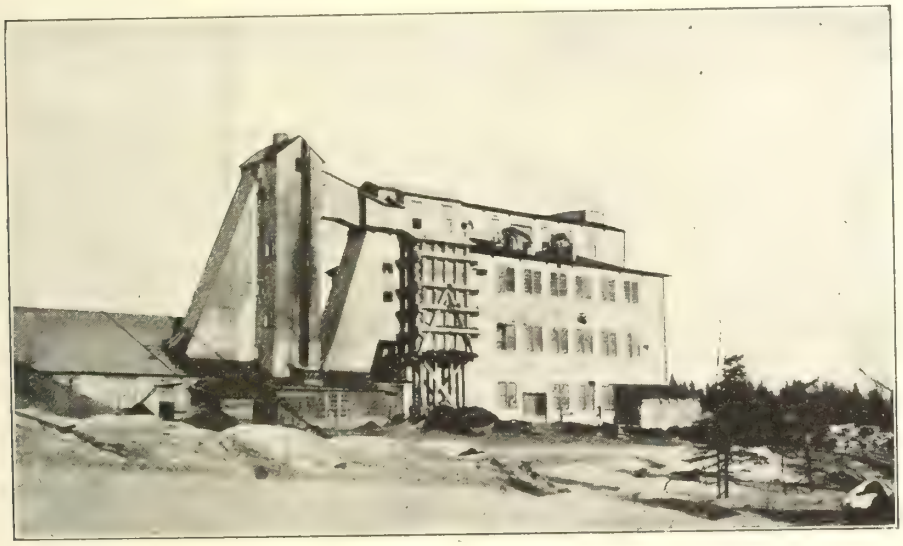
The secondary crushing equipment, though it all has the same object in view, viz., the further break-

ing down of the rock to about 2″ in preparation for drying, varies considerably throughout the district. Some mines use corrugated rolls, others jaw crushers, and others gyratory crushers for the purpose, while some use a combination of these, yet all seem to be satisfied with their respective practices and results.

Drying

Nor is there any standard practice for dryers. Many different types of these have been tried out in the district since the inception of the industry, only to be eventually discarded, till now most of the mills have a single shell, rotary type with forced draught applied under the fire box, which is sometimes installed at the charging end and at other times at the discharge end. Some of the largest operators prefer, on the other hand, the return current, internal tube, rotary type, the ore being raised to the top of the drying shaft by elevators, whence it drops by gravity over baffles, against the rising heat, to the bottom. Apart from the respective advantages and disadvantages from an operating point of view, the adoption of any type must be considered in the light of the class of ore to be handled and the condition desired at the end of the process.

After drying, the material is conveyed either direct for further treatment or to storage bins ready to be drawn upon as required.



Asbestos Mill at the Fraser Mine, E. Broughton

Ample storage facilities between the mine and the mill are, of course, most desirable in any mining operation. Under conditions such as obtain here, where the mines are liable to extended interruption through inclement weather, storage is an essential. Most of the mines have, therefore, storage bins of unusually large capacity, one of them having facilities to store as much as 20,000 tons of dried crushed rock.

Fine Crushing and Fiberizing

Once this dried material arrives at the mill proper, the process begins of extracting its fibre content. Any fibre already free is first of all removed from the rock by one of the usual suction methods. The rock is then passed to suitable comminuting and fiberizing machines to release from it the fibre it still contains in rock-like form.

It is the practice of some mills to treat this rock first in purely crushing machines, and then to pass it into one of the many types of fiberizing machines available for the purpose. Others do the breaking down and fiberizing concurrently in machines designed for the combined purpose. In the former practice gyratories, disc crushers or rolls, or some combination of these, are used to break down the rock which is then passed into the fiberizing machines, of many varieties such as cyclones and jumbos. In the latter practice the material passes direct to hammer mills either equipped with, or without, sizing grids, in which the crushing and fiberizing are done simultaneously. The resultant product of these is first passed under suckers to remove its freed fibre content, and is then passed to cyclones or jumbos, or both, for further treatment to free what fibre still remains.

After each operation the rock thus treated is passed over screens or through specially designed gravity apparatus to facilitate the removal by suction of its released fibre content, which is subsequently collected in separators, which collect it by centrifugal action.

The fibre recovery varies considerably from mine to mine according to the class of rock being treated and the grading that is practised. For individual mines it ranges from about 3 per cent. up to 15 per cent. or more; but the average for the whole field is about 5 per cent. of the rock mined and 6 per cent. of the rock milled.

Grading

The fibre thus collected is then treated on vibrating or rotating screens known as graders, by which it is cleaned and graded as required, ready for the market.

The grading is regulated by test in a testing machine that has been evolved for the purpose and adopted as a standard for the whole district. It consists of a nest of three trays or boxes, the top of which is equipped with a screen having a half-inch opening, the next with a 4-mesh screen, and the bottom with a 10-mesh screen. All are so fixed in the machine that they can be shaken together at 300 revolutions per minute with a horizontal stroke of 1½ inches and automatically stopped at the end of two minutes, the usual period of the test.

To test any grade of fibre, 16 ounces is measured and placed on the top tray and then shaken for the usual two-minute period when the quantity that remains on each screen is weighed separately to give the final test. By means of this machine the fibre is graded into the particular grades desired and is then bagged ready for shipment to the manufacturer.

THE MINING DISTRICTS

By THE JOURNAL'S CORRESPONDENTS

THE RECORD OF COBALT, PORCUPINE AND KIRKLAND LAKE

(by our Northern Ontario Correspondent.)

Cobalt

A good deal of interest is being manifested in the visit of the members of the A. I. M. M. E. to the Northern Ontario camps, and the local managers are making preparations to give their guests an interesting time. Two days will be spent in Cobalt and the vicinity, and although the Cobalt of to-day is very different from what it was a few years ago, it is still the most important silver camp in the country. Discovered twenty years ago, the extraordinary richness of the deposits gave the impression that it would be a very short-lived camp; but to-day, although its production is far below the peak, engineers hesitate to place any limit on its life, and the chances are the camp will still be producing at the end of another twenty years. The original discovery was La Rose, and to date from a comparatively few acres on this claim 20,000,000 ounces of silver have been produced. In 1905 the boom really started, and the camp rapidly grew in size and importance. In 1911 there were approximately 25 producing properties and in that year the output was about 32,000,000 ounces, and the few square miles comprising the camp was the third largest silver producing community of the world, being exceeded only by the whole of Mexico and the whole of the United States. From 1911 on, the production of the camp gradually declined until at present it is approximately 8,000,000 ounces a year, with seven companies producing.

Most of the production of the camp has come from the conglomerate of the Huronian series and from very shallow depths. Of the 20,000,000 ounces produced from La Rose claim, practically the whole came from within 100 feet of the surface. These shallow veins are becoming exhausted, but new possibilities are being opened up on the lower diabase-Keewatin contact, which throughout the larger part of the camp remains unexplored. Near the north end of the camp extensive exploration on this contact is being undertaken by La Rose and Continental, while in the Southeast part of the camp exploration on the lower contact will be undertaken on the Beaver at a depth of 1,200 feet. If these efforts are successful, (and La Rose is already producing substantial quantities of silver from this area), it will give a great impetus to further exploration, which may have a very important bearing on the future of the camp.

To date the camp has produced over 330,000,000 ounces of silver, and has paid out over $95,000,000 in dividends. Among the largest producers and dividend payers is the Nipissing, the most important silver mine in the world, with over $25,000,000 in dividends to its credit. The Coniagas was the most productive single forty acres in Cobalt, with an output of over 30,000,000 ounces and dividends of over $11,000,000. Kerr Lake has paid about $10,000,000, La Rose $7,500,000, Crown Reserve $3,000,000, McKinley-Darragh $6,000,000, Mining Corporation $6,000,000, Buffalo $3,600,000, Temiskaming over $2,000,000 and Hudson Bay $2,000,000.

Cobalt is also an important source of cobalt metal, and the smelters treating the ores from this camp practically control the world's market for cobalt and its salts. An other important by-product from Cobalt ores is arsenic, which is so largely used as an insecticide.

Power for the camp is supplied by the Northern Ontario power company, which both generates electric power and makes compressed air. The compressed air system, which is known as the Taylor Hydraulic System, is a unique installation and is the largest natural air compressor in the world, with a capacity of 44,000 cubic feet of free air per minute. The flow of the Montreal river is diverted into two shafts, the tops of which are fitted with an adjustable casing filled with 14-inch pipes. The falling water sucks the air down with it and this air is released in a large drift 1,000 feet long, with a collecting chamber above it. The water passes up through the outlet shaft, which is about 265 feet deep and whose depth governs the air pressure. The air is drawn off from the collecting chamber and transmitted to Cobalt, a distance of 9 miles, through a 20-inch pipe line, and from this a series of smaller pipes distribute it to the mines.

The Cobalt district, in addition to the importance it derives from its own production, has also contributed to an important extent to the development of other mines and mining districts. Money derived from Cobalt mines has helped to finance properties in South Lorrain, Gowganda, Kirkland Lake, Porcupine and many other places.

Porcupine

Porcupine was discovered in 1910, the largest mine there being the Hollinger, which was financed largely by money derived from Cobalt. The purchasers of the Hollinger were the Timmins-McMartin-Dunlap syndicate, who were also the original owners of La Rose. After working the latter property for a time and making a profit of $1,200,000, they sold it for $5,000,000, so that when they purchased the Hollinger they were well able to finance it to a producing basis.

The new camp passed through a great many vicissitudes. Transportation in the early stages was difficult, as the camp was 30 miles from the railway. Both Hollinger and Dome, however, went ahead with mill construction, hauling most of their supplies in over the winter roads. In 1911 a branch railway line was built, but just before its completion the newly constructed Hollinger mill was burned. In the summer of 1911 the Dome mill was almost completed when disastrous forest fires destroyed practically the whole of the Porcupine camp. Undismayed, the operators again began construction and in March 1912 the Dome mill was completed and put in operation. The recovery of gold for the first year averaged $13.41 a ton, a figure that has not since been equalled until the present year. Even then, many years of difficulty were ahead of Porcupine. Operations were just nicely going when the war broke out, and with shortage of labor and constantly mounting costs, production was curtailed and some of the properties were forced to suspend work entirely. After the armistice, labor was still scarce and costs high until 1921, when conditions changed. The future, for the first time in years, looked very bright, when progress was again halted by shortage of power. In 1922 the worst power shortage in the history of the northern mining districts was experienced, but despite this fact, Northern Ontario gold production amounted to about $20,000,000, or 80 per cent. of the total for Canada

Porcupine is just getting into its stride and already is one of the big gold camps of the world. Hollinger is near the top of the list of great gold mines and is producing at the rate of about $1,000,000 a month. The mill is treating approximately 4,600 tons a day, and the company proposes to increase this to 8,000 tons daily. To ensure an adequate power supply the company is developing 20,000 horsepower on the Abitibi River.

The McIntyre has had the most interesting career of any of the Porcupine mines. In 1912 it had a 100-ton mill with hardly enough ore to feed it, and sometimes not enough money to pay for supplies. Evading creditors was, in those days, almost an actual physical exercise Ten years later it had a 1,000-ton mill, and also the brightest future of any of the mines. Present production is $300,000 a month from the 1,000-ton mill, which will shortly be increased to 2,000 tons. Plans for a 5,000-foot shaft and a 5,000-ton mill are being considered and predictions are made that within five years its production will surpass even that of the Hollinger.

The other big mine of Porcupine is the Dome, which has a 1,200-ton mill and is producing about $400,000 a month. Starting off as a high-grade mine, it gradually developed into a very low-grade one and was at one time treating about $4.00 ore. Below the 6th level better ore was encountered and at present it is the highest grade producer in camp, with an average recovery of over $13.00.

Kirkland

Kirkland, unlike Cobalt and Porcupine, never had a real boom. Its development has been more gradual, and while its output is small as compared with Porcupine, it is one of the important gold camps of the continent, and that with its history still mostly to be made. Original surface discoveries were small and bore very little relationship to the important ore-bodies found at comparatively shallow depths. The original discovery was the Tough-Oakes, which produced exceedingly rich ore at the beginning. A mill was built and dividend payments made, but the company fell on hard times and the property was closed for several years. Active development was again started by new English owners and the property holds out promise of being again a profitable producer. The Teck-Hughes had a disappointing early history and was under option to several different companies. Only within the last couple of years did it really begin to forge ahead and it is now the highest grade producer in Canada, with an average of approximately $30.00 a ton, and a monthly recovery of about $100,000. The Lake Shore, with a 60-ton mill, is averaging about a $23.00 grade, mostly from development. A 300-ton mill is now being built, which the company expects to have operating this fall. The Lake Shore has been brought to its present position by the individual efforts of the original staker, and is one of the few instances where this has occurred. Another important producer is the Wright-Hargreaves, with a 200-ton mill and an output of about $75,000 a month. This mill is also being enlarged to bring it up to 400 tons a day capacity. A good deal of development work is being done in other parts of the camp, which will probably result in other properties being brought to the producing stage.

ASBESTOS IN TRANSVAAL

Reports emanating from Johannesburg describe a large deposit of asbestos from which, it is asserted, mining by steam shovel will produce short grades of fibre at a cost of 1 shilling a ton. It is 35 miles from the railway, and a branch line is said to be contemplated by the American investors interested.

NORTHERN ONTARIO

Kirkland. — The progress being made in the Kirkland Lake field is indicated by a production of $1,500,000 in the first six months of the current year, thus setting up a new production record for the camp. The largest contributor was the Teck-Hughes, with an output of about $575,000. from ore with an average grade of about $30,00. The Wright-Hargreaves produced $420,000 and the Lake Shore $295,000. During the month of June the Lake Shore produced 1,950 tons and recovered $57,198, or an average of $29.34 a ton, which constitutes a new record for the mine. The company has declared a dividend of 2 per cent payable August 15th to shareholders of record August 1st. Good progress is being made in the additions to the mill, which will bring it up to a capacity of 300 tons a day. Development work is now being carried on at the 800-foot level and this work will add materially to the ore reserves. The Wright-Hargreaves is also making additions to its mill to bring the capacity up to 400 tons a day. A mucking machine has recently been installed underground in order to handle the increased tonnage without increasing the labor force. The Kirkland Lake Proprietary is carrying on the most extensive development scheme in its history and is doing approximately 800 feet of drifting and crosscutting a month on the three lower levels at the Tough-Oakes mine. The surface equipment and the mill have been put in shape for operating, and if this development work gives satisfactory results, it is expected the mill will start running before the end of the year.

Porcupine. — At a recent meeting of the Porcupine Gold fields Development and Finance Company, held in London, it was announced that the company had taken over the share capital of the British Porcupine Development Company, which is now being liquidated. The taking over of these assets will entitle the company to options on a large number of shares in the Canadian Gold Mines Corporation, which is developing the Rochester property in Porcupine. The Rochester shaft has reached a depth of 425 feet, and a short distance lower down a station will be cut and cross-cutting started. The company has arranged for its consulting geologist, Dr. McLaren, to investigate several properties in British Columbia..

The Schumacher Mines is making a final distribution of 16 cents a share from the money received from the sale of the company's properties to the Hollinger. The Hollinger's central shaft has reached a depth of 1,700 feet. The Hollinger is now treating 4,600 tons a day, which is a record in the history of the mine. New machinery is being installed which will result in the tonnage being gradually being brought up to 8,000 tons a day. There is plenty of power available and it is stated that there is a surplus of approximately 5,000 h.p.

The McIntyre proposes to increase its present mill to 2,000 tons a day. This increase can be brought about with a minimum of new equipment. By installing another 8-foot Hardinge mill there will be plenty of grinding capacity, and by installing filters to permit of a shorter tank treatment, there will be enough tank capacity.

Cobalt. — The Mining Corporation has taken an option on a group of claims in the Gillies Limit, on which it is proposed to sink a shaft to a considerable depth. Among the properties optioned is the Burke claim, on which a small showing of silver was found some months ago. The silver showing, in itself, was very small, but the geological conditions are favourable and a real effort will be made to develop these properties. The most extensive work done on the Limit to date has been on the Provincial, Wyandoh and Waldman, all of which produced silver, but not in large quantities. The work proposed by the Mining Corporation will be the most extensive ever done on any properties in the Limit that did not have considerable surface showing.

During the first six months of the present year the Nipissing's production had an estimated net value of $1,100,767, which is in excess of the corresponding period of the preceding year. The output amounted to 1,675,000 ounces, which is an average of about 275,000 ounces a month.

Gold Strike in McNeil Township. — Last June gold was discovered in the Township of McNeil, near the Matachewan district, by Indians, and this has resulted in a rush to this district and the staking of a large number of claims. Some coarse free gold has been found in small quartz stringers, cutting the porphyry. It is doubtful if the surface showings indicate a commercial ore-body, but there is a strong possibility that a sufficient concentration may be found to give commercial values over mining widths. This chance will be enhanced if it is found that the porphyry, as well as the small veins, carries values. An option on the original discovery has been taken by a Toronto syndicate, headed by W. E. Segsworth.

BRITISH COLUMBIA

Britannia. — The Britannia Mining & Smelting Co., Howe Sound, is reported to have mined 75,000 tons of ore during the month of July. Their plant at Britannia Beach, substantially increased in size and brought up-to-date in every particular, is working at capacity. Some 500 men are employed underground. The management continues its policy of prospecting and developing new ground while extracting the ore already blocked out. Entirely new ground is being prospected in the Indian River District back of the present workings.

Stewart — It is announced that Samuel I. Silverman, of New York, has acquired the interest of W. R. Tonkin in the Fish Creek Mining Company, control of which is held by the American Mining & Milling Co. The latter Company has purchased the Georgia River Group of mineral claims, sixteen miles south of Stewart on the Portland Canal, thus giving them three properties, viz., the Fish Creek, the Betty, and the Georgia. On the Georgia stripping already has started and the ore-body is reported to have been sampled with gratifying results.

The Indian Mines Ltd., operating in the Portland Canal District, is being wound up and re-organized under the name of the Indian Mines Corporation Ltd., the latter having a capitalization of $3,000,000. The purpose is to take over a number of adjoining properties which, in the judgment of G. D. B. Turner, the managing director, and his colleagues, are essential for the development of the mine. R. B. Lamb, mining engineer, was a recent visitor to the property. Montreal and Toronto capital has become largely interested.

Good Field for Prospecting. — Mr. George Clothier, who has been on a brief visit to Victoria to consult with the Hon. Wm. Sloan, Minister of Mines, in regard to road and trail construction in the northwestern section of British Columbia, which he represents as Government mining engineer, is much interested in the opening up of the territory east and north of Portland Canal drained by the Unuk, Stikine and Iskut rivers. He has completed a trip through parts of this region and is more than ever confident that it is a field of promise from the viewpoint of prospectors. Difficulty of access is its present handicap. It can be reached by topping the Salmon river glacier or by travelling up the Unuk River from Burroughs Inlet, Alaska. The practical method would be the construction of a road through Alaskan territory to the Canadian boundary and the continuation of this road some distance into the little explored district. With such a main artery it would be possible, as the need arose, to open the country with branch trails. To carry out this comprehensive proposal the co-operation of the Alaska Road Commission is required and it is understood that representations along this line are to be made to that body. The B. C. Department of Mines, it is said, would be prepared to do its part if assured of the assistance indicated from the American authorities.

(Editor's Note — Owing to lack of space further correspondence from British Columbia, Alberta and Nova Scotia is unavoidably held over.)

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Advertisements other than "Employment Wanted" or "Employees Wanted" will be inserted in this department at the rate of 20 cents per agate line (14 agate lines make one inch). $2.80 per inch, each insertion, payable in advance. Space measured from rule to rule. When four or more consecutive insertions of the same advertisement are ordered a discount of 25 per cent. will be allowed.

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POSITION WANTED — A Canadian Mining Engineer graduate of Canadian University, specialized in the geology, development and operation of iron mines on a large scale in the Western States, desires to return to Canada to follow up the iron industry. Can give best references. Apply Box 602, Canadian Mining Journal, Gardenvale, Que.

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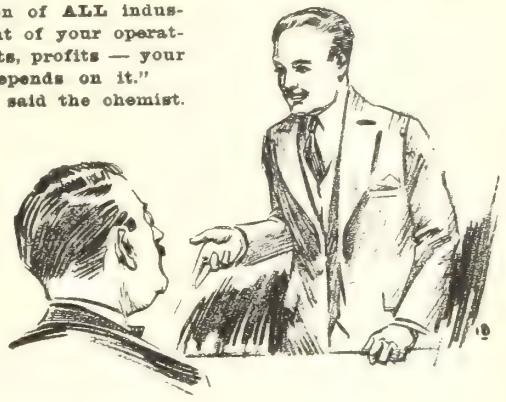

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MINES BRANCH

Recent Publications

Talc and Soapstone in Canada, by H. S. Spence.

Titanium, by A. H. A. Robinson.

Summary Report of Investigations made by the Mines Branch during the calendar year ending Dec. 31, 1921.

Phosphate in Canada, by H. S. Spence.

The Preparation, Transportation and Combustion of Powdered Coal, by John Blizard.

Road Materials along the St. Lawrence River, from Quebec Boundary to Cardinal, Ont., by R. H. Picher.

Barium and Strontium in Canada, by H. S. Spence.

The Coal-fields and Coal Industry of Eastern Canada, by F. W. Gray.

Analyses of Canadian Fuels. Part I to V, by E. Stansfield, M. Sc., and J. H. H. Nicolls, M. Sc.

Graphite, by H. S. Spence.

Gas Producer Trials with Alberta Coals, by J. Blizard and E. S. Malloch.

The Mines Branch maintains the following laboratories in which investigations are made with a view to assisting in the developing of the general mining industry of Canada:—

Fuel Testing Laboratory.—Testing value of Canadian fuels for steam raising and production of power gas; analyses, and other chemical and physical examinations of solid, liquid and gaseous fuels are also made.

Ore-Dressing Laboratory.—Testing of Canadian ores and minerals, to ascertain most economical methods of treatment.

Chemical Laboratory — Analyzing and assaying of all mineral substances and their manufactured products. Copies of schedules of fees, which are slightly in excess of those charged by private practitioners, may be had on application.

Ceramic Laboratory.—Equipment is such that complete physical tests on clays and shales of the Dominion can be made, to determine their value from an economic standpoint.

Structural Materials Laboratory.—Experimental work on sands, cements and limes is also undertaken.

Applications for reports and particulars relative to having investigations made in the several laboratories should be addressed to **The Director, Mines Branch, Department of Mines, Ottawa.**

GEOLOGICAL SURVEY

Recent Publications

Memoir 108. The Mackenzie River Basin, by Charles Camsell and Wyatt Malcolm.

Memoir 127. Beauceville map-area, Quebec, by B. R. MacKay.

Memoir 128. Winnipegosis and Upper Whitemouth River areas, Manitoba, Pleistocene and Recent deposits, by W. A. Johnston.

Memoir 129. Geology of the Moncton map area, by W. J. Wright.

Memoir 130. Geology and mineral deposits of the Bridge River map-area, British Columbia, by W. S. McCann.

Memoir 131. Kenogami, Round and Larder Lake areas.

Memoir 132. Geology and ore deposits of Salmon River district, British Columbia, by S. J. Schofield and G. Hanson.

Memoir 133. The southern part of the Sydney coal field Nova Scotia, by A. O. Hayes and W. A. Bell.

Map 68A. Moncton, New Brunswick. Geology.

Map 155A. Portions of the districts of Algoma, Sudbury and Timiskaming, Ontario. Geology.

Map 1585. Mackenzie River basin, 1922 edition. Geology.

Map 1751. Wainwright, Alberta. Topography.

Map 1752. Monitor, Alberta and Saskatchewan. Topography.

Map 1767. Sydney, Nova Scotia. Geology.

Map 1830. Vermilion; townships 47 to 55, ranges 5 to 10, west of the fourth meridian. Topography.

Map 1831. Vegreville; townships 47 to 55, ranges 11 to 16 west of the 4th meridian, Alberta. Topography.

Map 1860. Keno Hill area, Mayo district, Yukon. Geology.

Map 1948. Wanapitei Lake area, Ont. Geology.

Map 1964. Brockville-Mallorytown area, Leeds county, Ontario. Geology.

Map 1965. Fraser River delta, British Columbia. Geology.

Map 1972. Michipicoten area, Ontario. Geology.

Map 1977. Mackenzie river between Norman and Beaver river, district of Mackenzie. Geology.

Applicants for publications not listed above should mention the precise area concerning which information is desired.

Summary Report — The annual Summary Report of the Geological Survey is now printed in parts. Applicants should, therefore, state what particular geologist's report is required, or what subject they are interested in.

The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon.

Communications should be addressed to **The Director, Geological Survey, Ottawa.**

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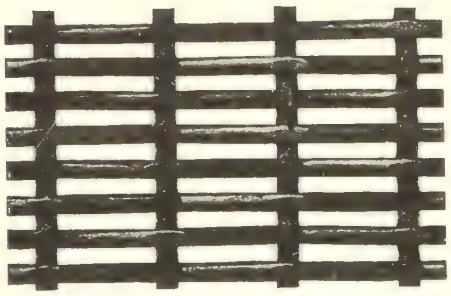

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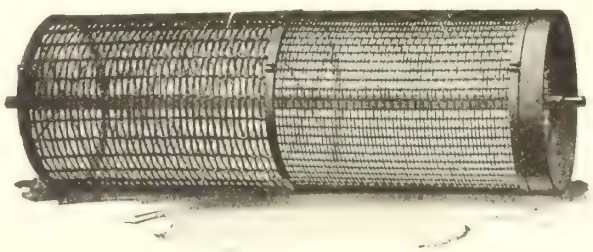

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Economic Minerals

In addition to the above, practically all economic minerals (coal and tin excepted) are found in Ontario: — actinolite, apatite, arsenic, asbestos, cobalt, corundum, feldspar, fluorspar, graphite, gypsum, iron pyrites, lead, mica, molybdenite, natural gas, palladium, petroleum, platinum, quartz, salt, talc and zinc. This Province has the largest deposits on the continent of talc, feldspar, mica and graphite.

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Mineral Production

Preliminary returns show the output of the mines and metallurgical works of the Province for the year 1922 to be worth $62,202,169, of which the metallic production was $38,190,711.

The following figures show the growth of Ontario's mineral industry by five-year periods since 1891 when a Bureau of Mines was first established.

Year.	Value.	Year.	Value.
1891	$4,705,672	1911	$41,976,797
1896	5,235,003	1916	65,303,822
1901	11,831,086	1918 (Maximum war output)	80,308,972
1906	22,388,383	1921	48,128,387
	Dividends.		

Dividends and bonuses paid to the end of 1922 amounted to $28,096,699 for gold mining companies, and $86,238,185 for silver mining companies or a total of $114,334,884.

Mining Regulations

A miner's license costs $5.00 per annum, and entitles the holder to stake out in any or every mining division three claims of 40 acres each. After performing 200 days' assessment work on a claim, patent may be obtained from the Crown on payment of $2.50 or $3.00 per acre, depending on location in unsurveyed or surveyed territory.

Assay Office

The Provincial Assays Office at No. 5 Queen's Park, Toronto, is maintained by the Department of Mines for the free identification of minerals, free assays under the provisions of the Mining Act of Ontario, and also for general assay work as per the Schedule of Charges which may be obtained on application.

Temiskaming Testing Laboratories

The Department maintains, at Cobalt, an ore sampling and testing laboratory which is now prepared to receive parcels of gold ore from 100 pounds upward, and after sampling and assaying the same to pay to the shipper the value thereof, less treatment charges. The purpose is to afford a market for ores extracted by prospectors and others in developing their mining claims, enabling them to obtain funds which they can use for further work and to report on the most satisfactory method of treatment. Fuller information may be obtained on application to the Manager, Temiskaming Testing Laboratories, Cobalt, Ontario.

Publications

For list of publications, illustrated reports, geological maps and mining laws, apply to

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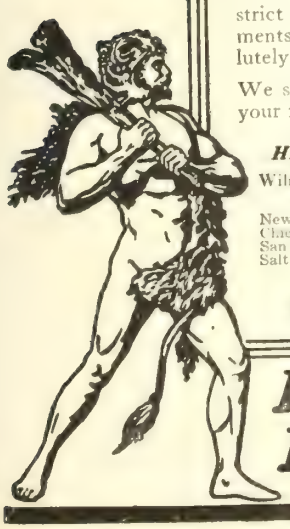

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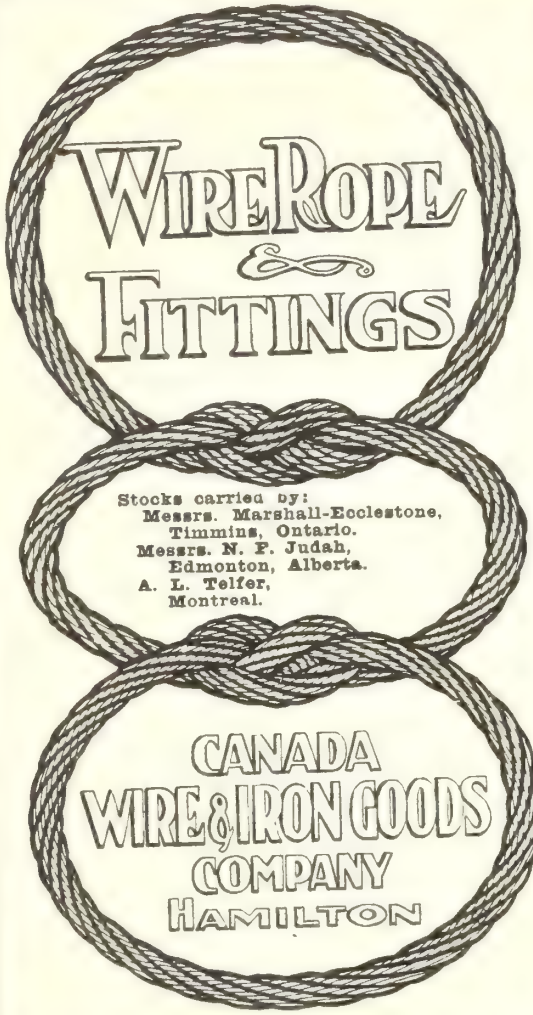

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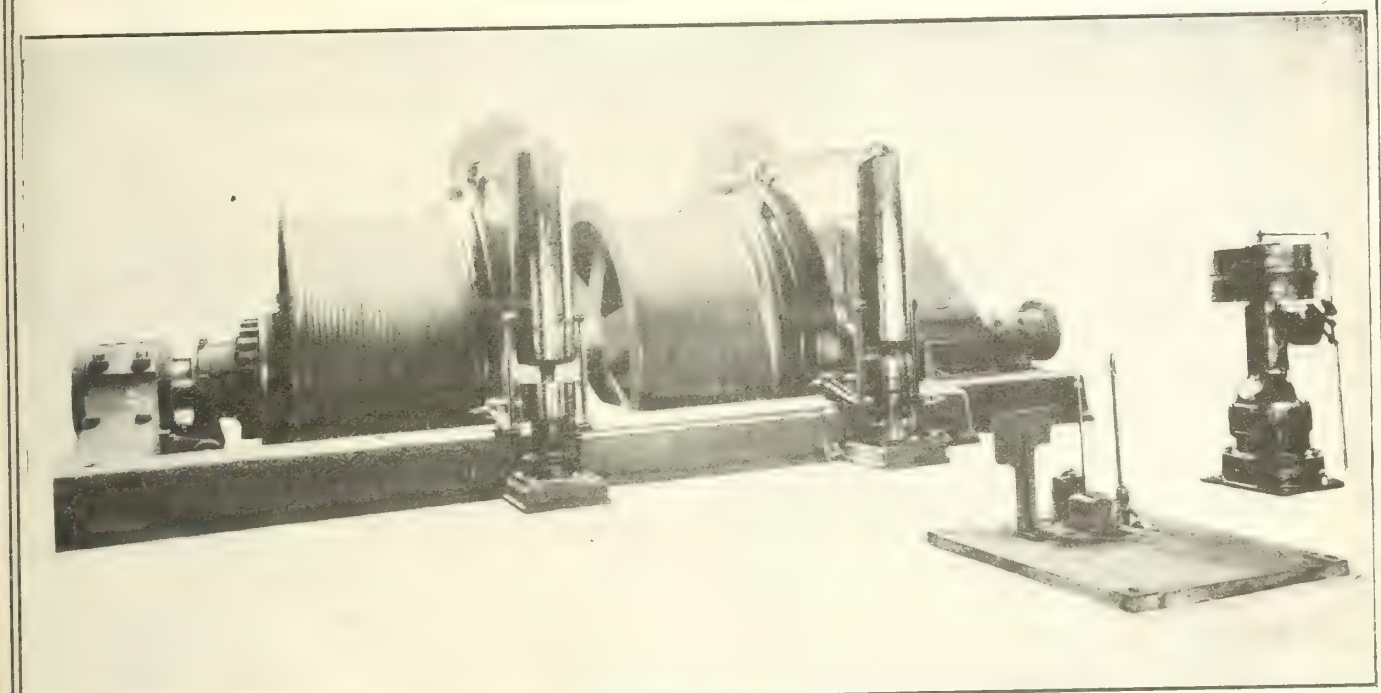

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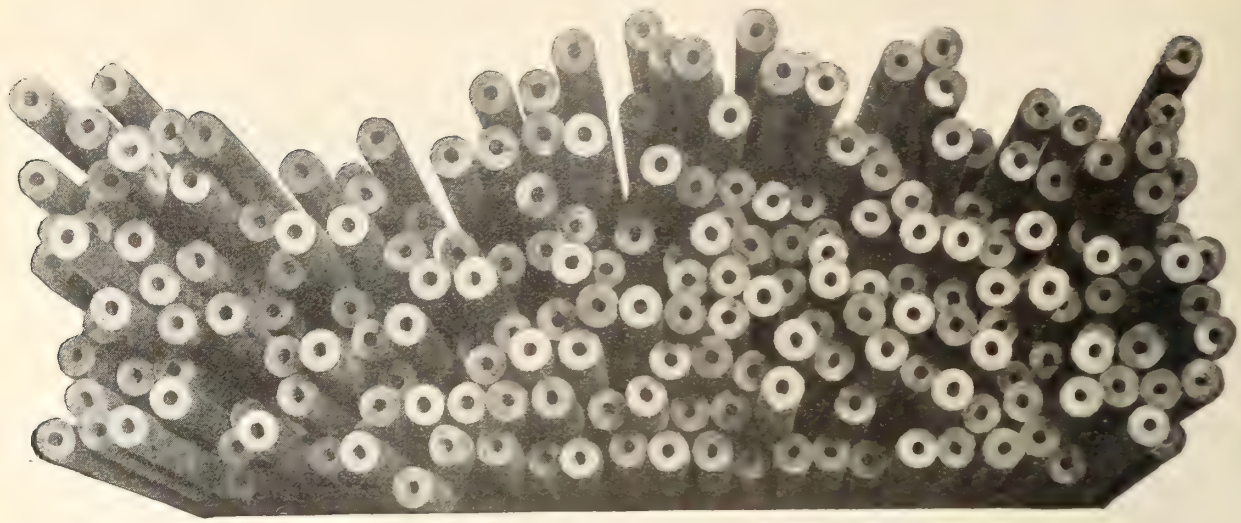

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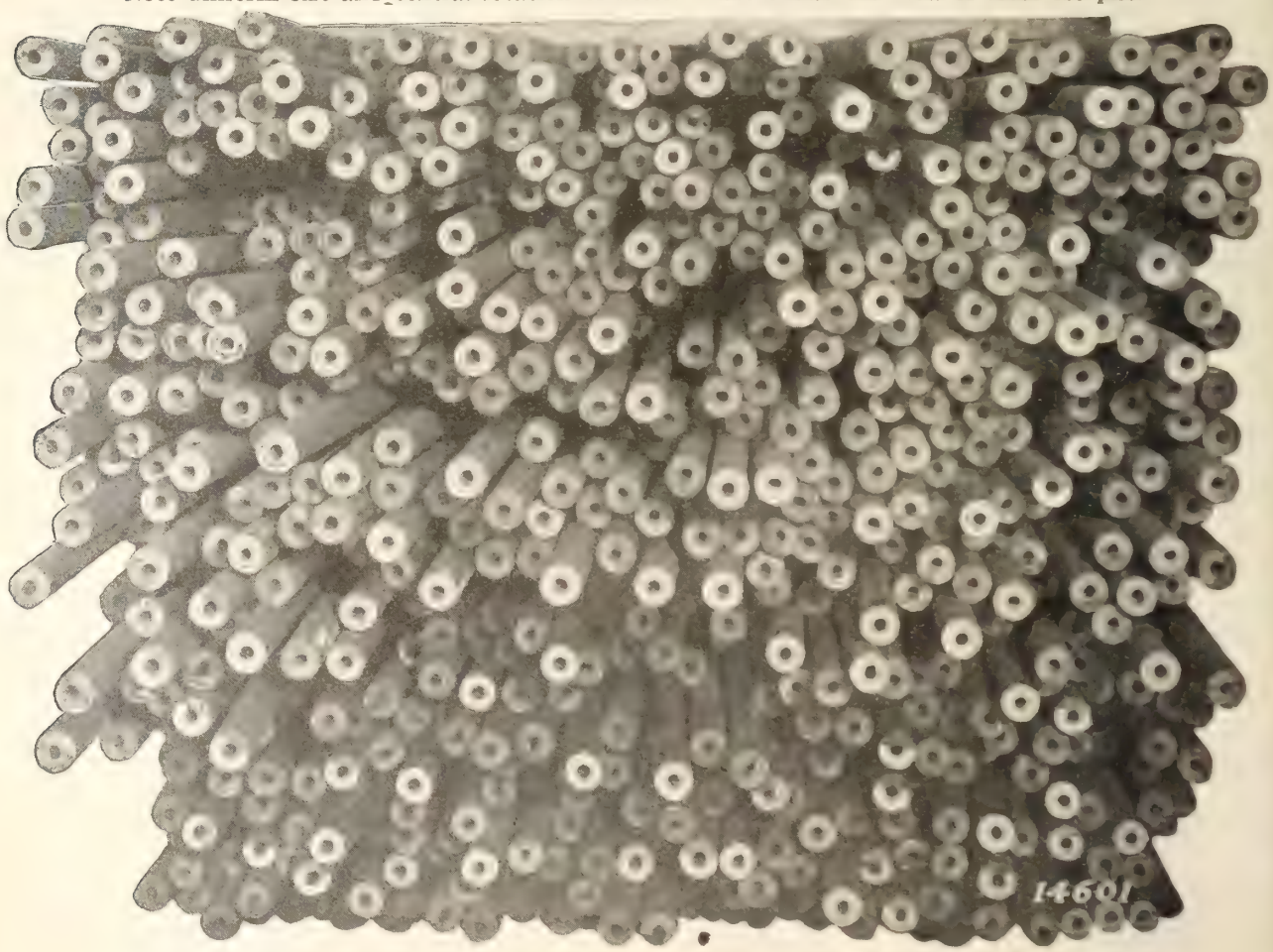

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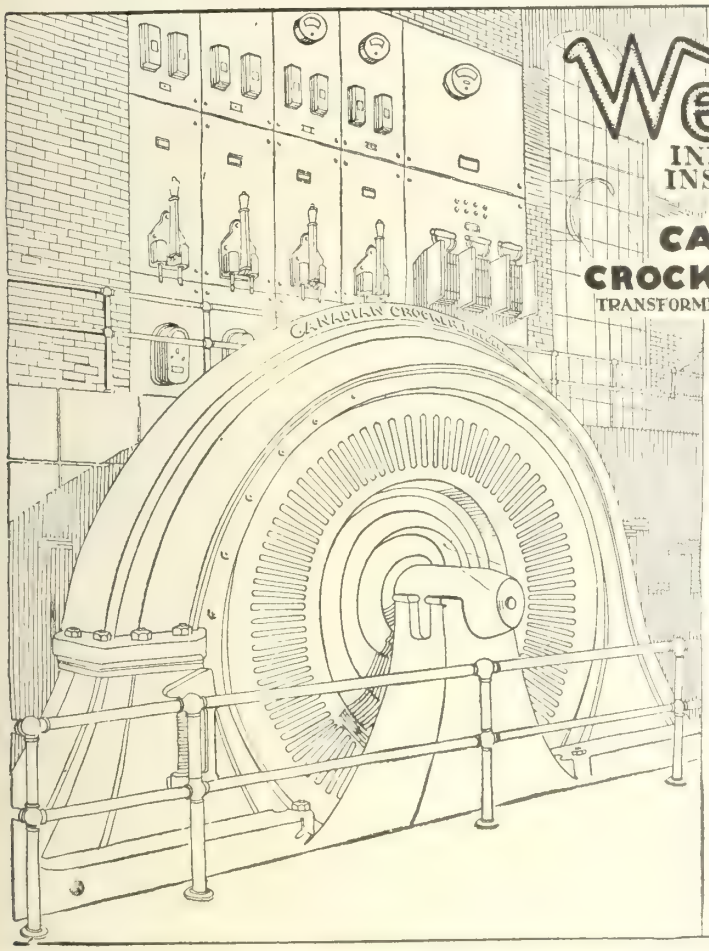

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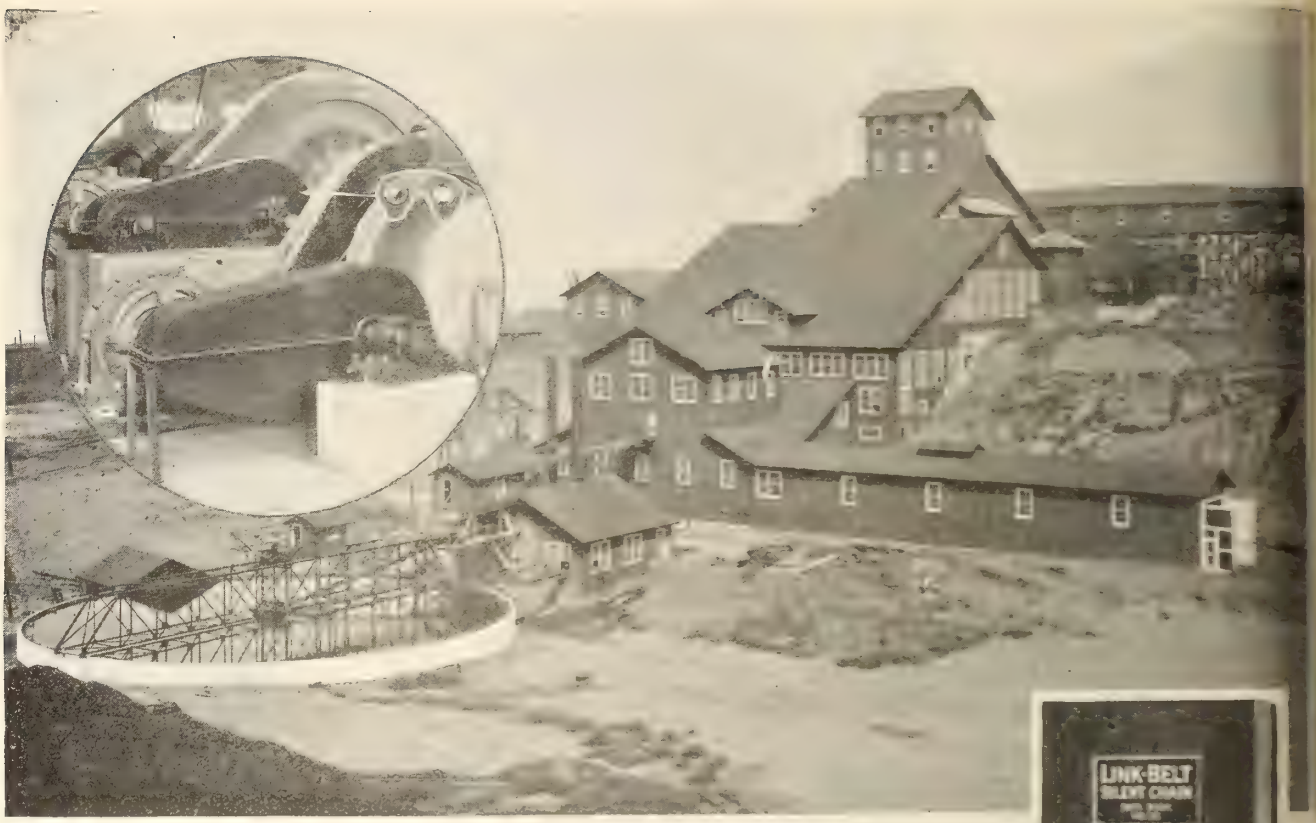

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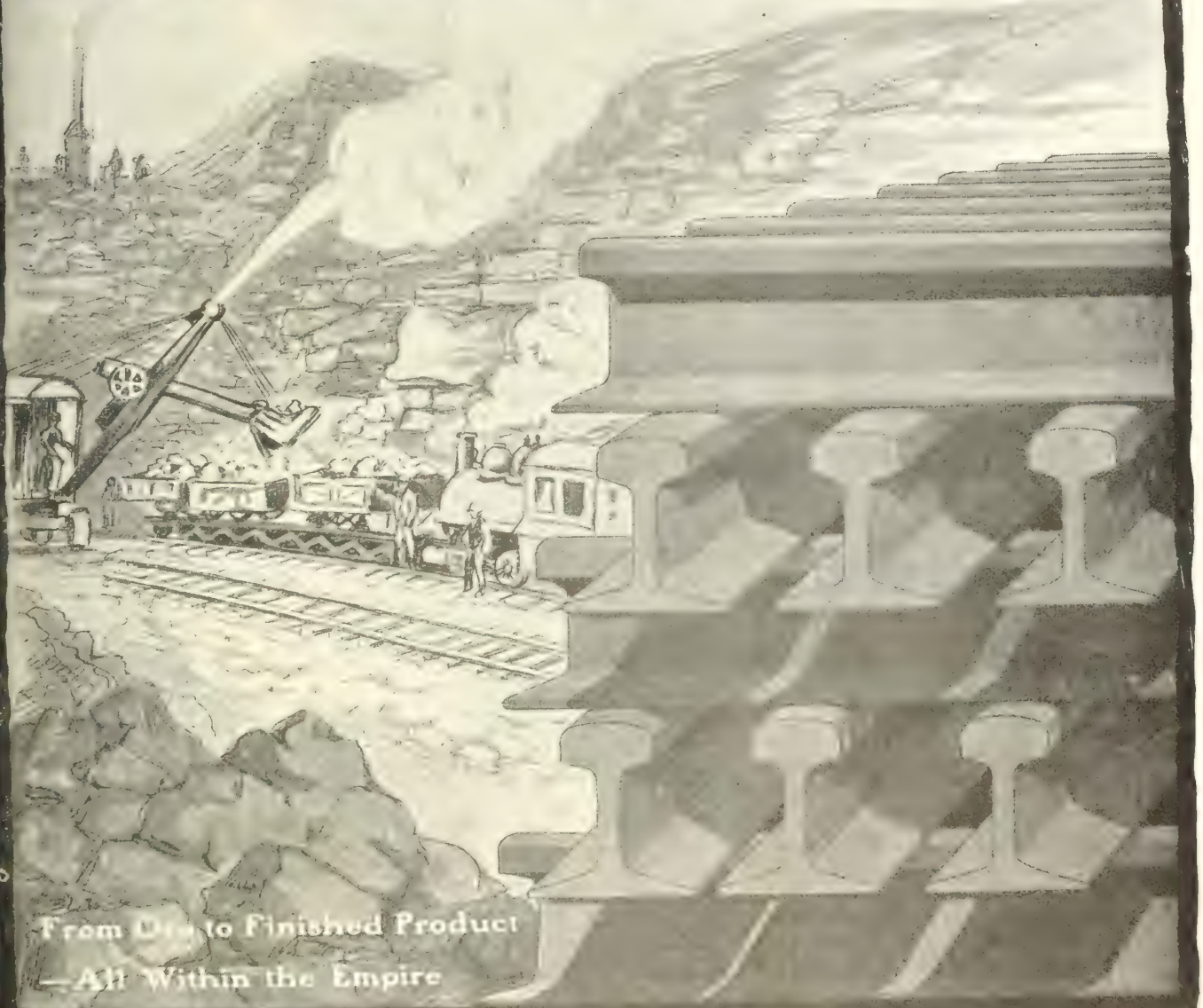

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Ontario's Minerals

PROVINCE OF ONTARIO

Hon. CHARLES. McCREA, Minister. DEPARTMENT OF MINES *Thos. W. Gibson*

Mineral Areas

Ontario, with its 407,262 square miles, contains many millions of acres in which the geological formations are favourable for the occurrence of minerals 70 per cent of the area being underlain by rocks of pre-Cambrian age. The phenomenally rich silver veins of Cobalt, Gowganda and South Lorrain occur in these rocks; so also do the far-famed nickel-copper deposits of Sudbury, the gold of Porcupine and Kirkland Lake, and the iron ore of Magpie and Moose Mountain mines.

Economic Minerals

In addition to the above, practically all economic minerals (coal and tin excepted) are found in Ontario: — actinolite, apatite, arsenic, asbestos, cobalt, corundum, feldspar, fluorspar, graphite, gypsum, iron pyrites, lead, mica, molybdenite, natural gas, palladium, petroleum, platinum, quartz, salt, talc and zinc. This Province has the largest deposits on the continent of talc, feldspar, mica and graphite.

Building materials, such as ornamental marble, limestone, sandstone, granite, trap, sand and gravel, lime, Portland cement, brick and tile, meet every demand.

Mineral Production

Preliminary returns show the output of the mines and metallurgical works of the Province for the year 1922 to be worth $62,202,169, of which the metallic production was $38,190,711.

The following figures show the growth of Ontario's mineral industry by five-year periods since 1891 when a Bureau of Mines was first established.

Year.	Value.	Year.	Value.
1891	$4,705,672	1911	$41,976,797
1896	5,235,003	1916	65,303,822
1901	11,831,086	1918 (Maximum war output)	80,308,972
1906	22,388,383	1921	48,128,387
	Dividends.		

Dividends and bonuses paid to the end of 1922 amounted to $28,096,699 for gold mining companies, and $86,238,185 for silver mining companies or a total of $114,334,884.

Mining Regulations

A miner's license costs $5.00 per annum, and entitles the holder to stake out in any or every mining division three claims of 40 acres each. After performing 200 days' assessment work on a claim, patent may be obtained from the Crown on payment of $2.50 or $3.00 per acre, depending on location in unsurveyed or surveyed territory.

Assay Office

The Provincial Assays Office at No. 5 Queen's Park, Toronto, is maintained by the Department of Mines for the free identification of minerals, free assays under the provisions of the Mining Act of Ontario, and also for general assay work as per the Schedule of Charges which may be obtained on application.

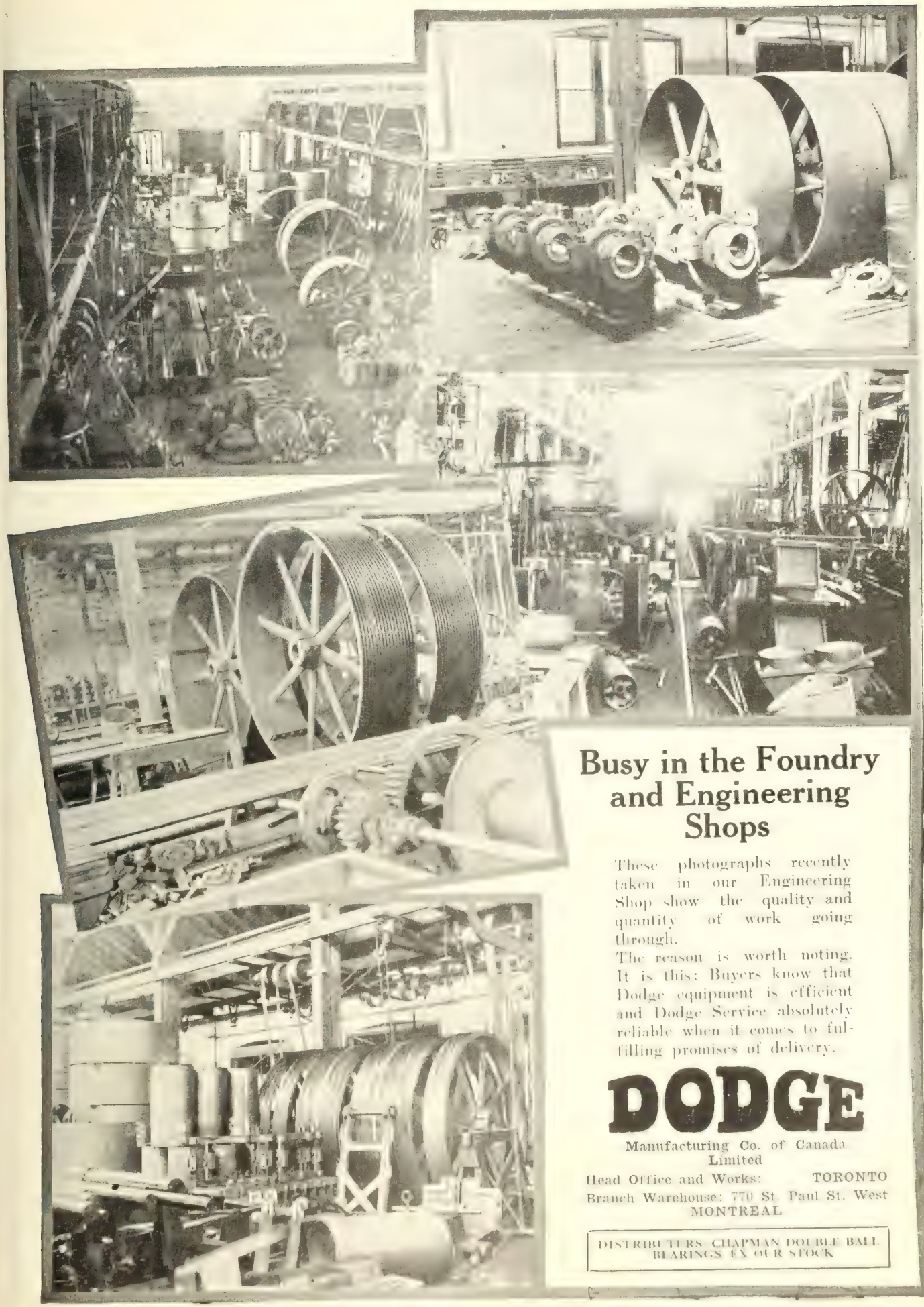
Temiskaming Testing Laboratories

The Department maintains, at Cobalt, an ore sampling and testing laboratory which is now prepared to receive parcels of gold ore from 100 pounds upward, and after sampling and assaying the same to pay to the shipper the value thereof, less treatment charges. The purpose is to afford a market for ores extracted by prospectors and others in developing their mining claims, enabling them to obtain funds which they can use for further work and to report on the most satisfactory method of treatment. Fuller information may be obtained on application to the Manager, Temiskaming Testing Laboratories, Cobalt, Ontario.

Publications

For list of publications, illustrated reports, geological maps and mining laws, apply to

Thos. W. Gibson,
Deputy Minister of Mines.
TORONTO, CANADA



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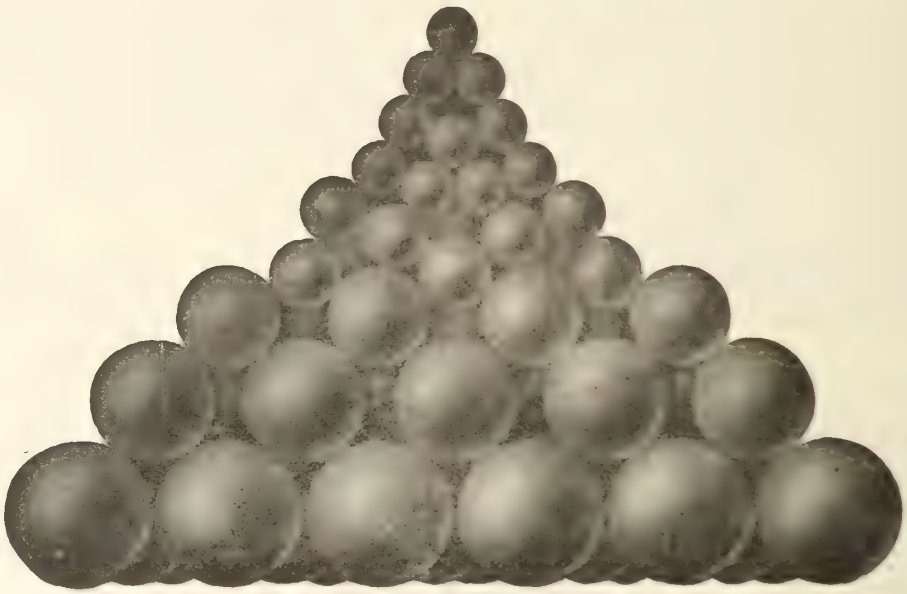

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PUBLISHED WEEKLY

Devoted to the Science and Practice of Mining, Metallurgy and the Allied Industries; and more particularly to their progress in Canada

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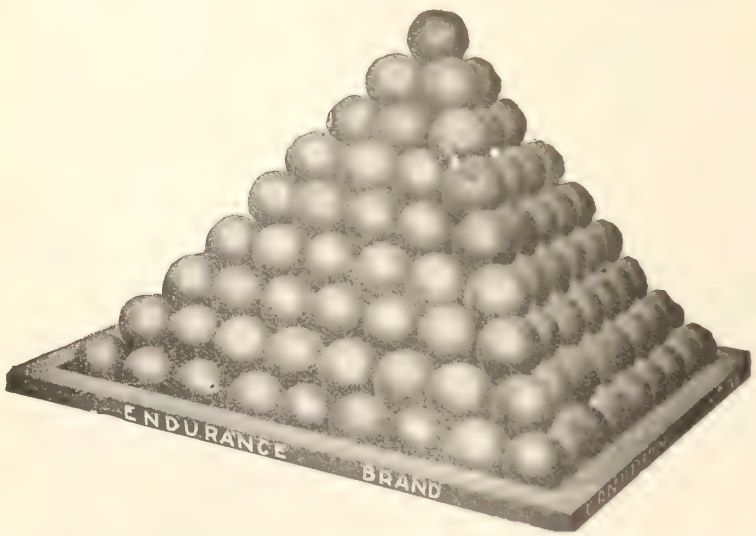

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:-: EDITORIAL :-:

A TIP TO TEACHERS

The mining engineers of today in Canada have been rained to become the servants of corporations. The echnical training in our mining schools is still di-ected to this end almost exclusively. The field for employment for such technically trained men is lim-ted, and now is about filled. The schools are turning out graduates of this type faster than employment an be found for them in mines and mills. The min-ng industry needs the services of these men in other ines of work. The curricula of our schools should be altered to suit this need.

These are conclusions to which we have come after much thought. They may represent rather an extreme view of the case; but we are confident they point in the right direction.

Canada is pre-eminently a land of undiscovered possibilities, particularly in the field of mining. In other lines of human endeavour it is becoming the vogue to an increasing extent to turn the forces of technical training in the direction of fundamental progress. The agricultural colleges are seeking breeds of wheat that will resist rust, and are gradually developing cattle that will give more milk and butter or better beef. The electrical industry employs corps of physicists and chemists, fresh from the colleges, in pursuing the unknown. The insurance companies have made their business safe by using calculations in the higher mathematics. Banks are commencing to require a period of scholastic preparation on the part of their responsible employees. Mining education in Canada is well designed to equip a young man for managing a mine or mill; but what does it do to point him towards the undiscovered treasures of mineral that must be found before mine and mill are possible?

To find payable ore-deposits and to bring them to the stage of production is, as we see it, the crucial problem of Canada's mining industry today. Heretofore it has been left almost entirely to the attention of self-trained prospectors, and to chance. True, there have been attempts to bring to these prospectors the aid of modern science, namely by way of an elementary knowledge of the minerals and the rocks. The assistance thus rendered the prospectors has been so remarkably fruitful that it is extraordinary that there has been no systematic attempt to tackle the problem the other way round, by turning the technically trained mining man into a prospector.

There have been, of recent years, a sufficient number of instances where technically trained mining men have taken up first-hand prospecting as their professional work to show that it is entirely feasible. In fact the "scouts" of a number of mining companies and syndicates have, in some cases, turned from the doubtful habit of passing on other men's "shows" to making finds on their own account. Some employers are coming to realize, still only dimly, we fear, but with growing clearness, that it is more profitable to keep a well qualified man continuously at work prospecting in a likely field than it is to have him travelling hither and thither, spending most of his time on train and trail.

More important, though, is the number of young mining men, still only a handful, who are prepared to risk their time and effort in first-hand exploration and development. A generation ago these men would have put up a shingle and waited for business; today they are "rustling" business.

It is in this direction we believe, that our mining schools should attempt to point a large part of their graduates. In this direction lie hard times, and effort above the ordinary; but the goal is success such as is far beyond the reach of him who remains a corporation's servant. We need more technically trained prospectors. It is a promising field for young men, and will remain so for a generation or more to come. The teachers in our mining schools can help to fill this need.

THE MINORITY WINS

During the first three months of this year we discussed in these pages the affairs of the Canadian Institute of Mining and Metallurgy at some length and from different angles. Our conclusion in general was that, though its members include men of first-rate ability and many whose talents could make it an active, national institution, it remains in a nutritional state. We pointed out that "what the Institute lacks at present is worthy and adequate objects upon which to expend its energies."

The August issue of the *Bulletin* contains information that corroborates this view. At the last annual meeting, in Montreal, it was proposed by a group of members in British Columbia that the by-laws be so altered as to change the requirement for membership to include strictly technical qualifications, and that those interested in the mining indus-

try but lacking these technical qualifications be classed as associate members. The proposed "member" class would, then, include the present "professional member" class, while the proposed "associate member" class would include all others except students. The amendment, submitted to all members by latter ballot, has passed by a vote of over three to one, and now is incorporated in the by-laws.

The avowed object of the western members who sponsored this by-law and whose concerted action has won the day is to make membership in the Institute mean more than it does at present. In this they have our hearty support, though we would have pursued the same object in a different way. They have demonstrated the fact that a small minority, actively interested in Institute affairs, can outvote the remainder of the members. The Secretary records the fact that of 1218 ballots sent out, but 344, or 28.2 per cent. were returned, and that of these, 260, or 75.6 per cent., were marked for the adoption of the amendment. From the fact that, at the annual meeting, where no western members were present, the amendment was opposed unanimously, we would judge that eastern members have failed to cast their ballots. Thus the westerners deserve the privilege of imposing their will on the majority.

We are confident that the active minority who thus have demonstrated their power in the Institute will use it wisely. Their first move has been to alter the status of membership in such a way as to make it more significant of professional ability. This, however, is merely the means to an end, the ultimate object being to induce activities that are fully worthy of the attention of a national Institute. When such activities shall have been inaugurated, then we shall no longer have the pitiable record of eight hundred, or over seventy per cent. of the members, not sufficiently interested in their Institute to record their votes on a vitally important by-law. With all the members so actively interested as the westerners now are, the Institute will become the worthy representative of Canada's mining industry ,which at present is attracting attention throughout the world.

THE LAKE FORTUNE FIND

It seems as if the fortunes of the gold district in northwestern Quebec, which appeared to be waning, have been made. The discovery of a new and phenomenally rich vein on the shore of Lake Fortune, which we record on another page, will, unless there is an unforeseen diminution of values underground, soon be developed into the province's first successful gold mine. The discovery will lend renewed energy to those conducting the search elsewhere in the field.

Since its discovery in 1906, the property on Lake Fortune has been subject to a series of misadventures. Enough money has been raised in its name to make a good-sized mine and erect a modern mill. Only a fraction of the money was spent on the ground, however, and most of this was badly misapplied.

In spite of the dubious history of the property, Messrs. Alderson and MacKay took it in hand last spring, ready thus to spend their money principally on a favourable report made years ago by Mr. John A. Dresser. Their faith has been rewarded, and, along with Messrs. Goyer and Bonner and their associates in Montreal, they will recoup themselves handsomely for their investment. The shares of the Company are closely held and, needless to say, there will be no stock-jobbing and no "rigging" of markets. The property at last is in competent hands, and Mother Nature will be forced to disclose her treasures by the shores of Lake Fortune.

THE ALBERTA GAS FIELDS

No important oil-field has been found as yet in the Canadian West; but the search for petroleum has disclosed resources in natural gas whose importance is scarcely realized by the generality of Canadians. We have in progress in these pages a series of articles by Mr. Newton W. Emmens of Vancouver, describing these resources in natural gas and their uses. Ordinarily we consider gas as merely a source of heat and power. This natural gas can in many cases, be made to yield gasoline, carbon black and the rare gas helium. The decision of the Imperial authorities to subsidise an airship service would appear to make the commercial production of helium an economic possibility for the near future.

The hectic search for "gushers," with their prospect of a huge and immediate return for a comparatively small investment, has tended to obscure the potential value of the gas resources tapped during the progress of the search. The fact that the search for oil is still being carried on systematically by well-informed investors such as the Imperial Oil Company is sufficient to demonstrate that the vast petroleum-bearing areas of Alberta and the MacKenzie River are still promising fields for prospecting. A point noted by Mr. Emmens is that the systematic development of the gas fields for commercial use is quite as likely as not to disclose oil "pools". After all, only scattered wells have been drilled as yet in any but a few restricted localities. The more intensive search induced by the commercial development of the fields for gas may be just what is required to find the liquid petroleum.

Meantime steps have been taken to recover from some of the natural gas in Alberta the "natural gasoline" it contains. This will give a respectable annual production of motor fuel in the province that we hope will in the not far distant future provide Canada with all, or a large part of, her requirement of petroleum products.

THE NEW MINISTRY AND MINING

The creation of a separate Ministry of Immigration n Ottawa is highly satisfactory. The problem of im- nigration is far too important to be grouped with the)epartments of the Interior, Mines and Indian Affairs nder one minister. Capable and hard working as he s, we could hardly expect Mr. Stewart to give ade- uate attention to all these departments. He will ow have more time to devote to the Department of Mines, in which we are more particularly interested, s we believe he is himself.

We hope, however, that this separation of the De- artments of Mines and Immigration will not tend to bscure their intimate relationship. As we have ointed out on many occasions in these pages, the roblems of mining and of immigration and settle- nent are much more intimately connected than most f us realize. For instance, how many farmers would here be today in the Clay Belt along the Temiskaming nd Northern Ontario Railway had it not been for he silver mines of Cobalt and the gold mines of Por- upine and Kirkland Lake? These mining operations ave induced a settlement of the land, still growing pace, that will long outlast the mines.

We ask Hon. Mr. Robb, the new Minister of Immi- gration, to remember that mining, and particularly gold mining, is his best immigration agent.

JOINT INDUSTRIAL COUNCILS

The labour problem, always a serious consideration, is doubly so in the average mining community, cut off from the remainder of civilization and usually lack- ing in those artificial attractions upon which the modern workman has grown to depend for diversion and relaxation. Today we print a brief account of how the problem is being handled at Anyox, British Columbia, written by Mr. F. M. Kelley, secretary of the Anyox Community League and welfare officer for the Granby Company in the communities centred round their mine and smelter on Granby Bay.

Our Nova Scotia correspondent mentions also today the fact that the workers of the steel plant at Sydney have accepted the proposal of Mr. Bischoff, superintendent of the plant, that a joint industrial council be formed, somewhat like the Whitley councils that have proved so successful in England. The gist of the idea, here as at Anyox, is that the men shall, through elected representatives, manage their own community affairs, and that when these affairs concern also the Company, representatives of the latter shall join in the deliberations.

On numerous occasions we have alluded in these columns to the fact, denied by no thinking man, but acted upon by few, that the ordinary relations of workers and their employers in this country, as in the other English-speaking countries, is anomalous. We profess to be democratic, yet we persist in retaining the mediaeval attitude between master and man. Indeed we have lost much that was admirable in this attitude during past centuries, for the master has ceased to care for his man and the man has ceased giving willing and faithful service in return for this protection.

Gradually the democratising of industry is being effected. There are already in Canada some notable examples of successful industrial councils in works or organizations employing large numbers of men. The scheme is working famously at Anyox, which now is known as a real, good place to live, in spite of its isolation. A number of Canadian mining men will remember the fine community spirit, developed by similar means, at the old Helen Mine in Michipicoten, north of Lake Superior, which had only dog-team connection with the outside world during the winter months. Now comes Sydney with a somewhat similar problem for solution. We are confident that the principle of democratic rule, applied in this case as in the former cases, will prove to be similarly successful, and conducive both to the financial benefit of all concerned and to a more rational mode of living.

THE A. I. M. M. E. EXCURSION

Mr. E. P. Mathewston, the genial and capable President of the American Institute of Mining and Metallurgical Engineers, brought a merry company with him to Toronto on Monday morning of this week, where he was greeted by a section of our Canadian forces under the leadership of Mr. John A. Dresser. One would hardly have guessed that these holiday-makers, gathered from every State in the Union, represent the leadership in the mining industry of the greatest mining country of the world. They have come to Canada for a two weeks' trip with a serious intention; but this intention is not going to spoil their fun.

Hon. Charles McCrea is to accompany the excursion while it is in Ontario. Already he has taken occasion to reiterate, in somewhat more definite terms than formerly, the intentions of himself and his confrères in the new Provincial government with regard to the mining industry. We are pleased to note that they have in mind the abolition of the special tax on the nickel industry.

This close companionship of several hundred of the leading mining men of the United States and Canada in their tour of Canada's principal mining area is bound to have consequences of prime importance. The good fellowship engendered will always remain a mutual asset. The friction of mind on mind during the technical sessions will advance the respective sciences. The representatives of capital will see our Northland with a new vision. The days of travel through a vast region where only narrow strips of ground have been prospected will surely stimulate an active interest.

The excursion is off to a good start, and will wind up in a brilliant finish.

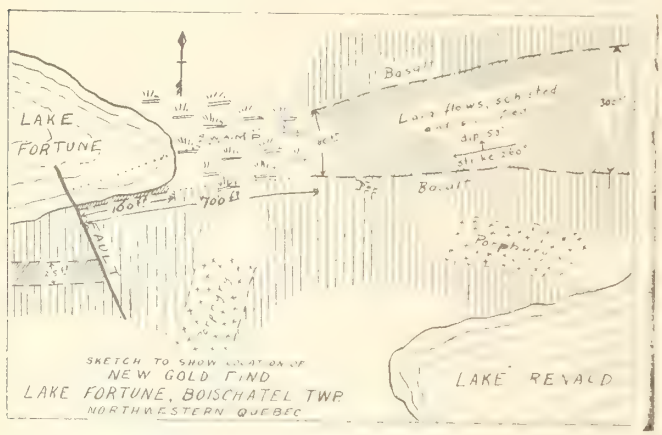
Spectacular Discovery at Lake Fortune

New Find on the Oldest Gold Property of Northwestern Quebec

By ALEXANDER GRAY

The most remarkable gold find of this year has been made recently by Messrs. W. P. Alderson and A. A. MacKay, mining engineers of Montreal. Both the accounts brought out by those that have seen the new find and the specimens of ore indicate that this is a discovery of genuine importance. Messrs. Alderson and MacKay are familiar with the spectacular outcrops of gold veins from Porcupine to the Yukon, and as examining engineers have turned down so many of these that the glamour of a second "golden sidewalk" is not at all likely to confuse their judgment of the vein's ultimate value.

Mr. MacKay made the discovery on the edge of Lake Fortune. An outcrop of mineralized schist on the water's edge attracted his attention as he was prowling about in true prospector fashion. Panning showed gold. The shore was heaped with fallen timber, and it took a day and a half to clear this away. Underneath there was more schist and quartz and more gold. He followed it eastward along the shoe for 160 feet, where it is covered by a swamp. All along it showed free gold, as well as sulphides and tellurides in large amount. At the western end it is terminated by a fault. Seven hundred feet to the



SKETCH TO SHOW LOCATION OF NEW GOLD FIND LAKE FORTUNE, BOISCHATEL TWP. NORTHWESTERN QUEBEC

east of this fault, beyond the swamp, the schisted zone outcrops again, and is 80 feet in width. It is heavily mineralized, pans gold all the way across, and shows visible gold in places. Still further east the schisted area widens to 300 feet. The assay returns from samples brought out corroborate the visible evidence.

This new ore-body is within sixty feet of some of the old workings of years ago. Former owners of the Lake Fortune were unfortunate in that their pits and drifts were misplaced. Now that the property is in the hands of experienced mining men who will apply every dollar of expenditure to advantage and who will find everything on the ground there is to be found, the hopes of the numerous engineers and geologists who have considered well of the Lake Fortune property are more than likely to be justified.

The Lake Fortune property was staked in 1906 by Auguste Renaud and Alphonse Olier. In 1911 the Union Abitibi Mining Company was formed to work it, stock was sold to the public, with a bonus of large promises, some machinery was brought in across the winter road from Larder Lake, and a mill was built. Little mining development was done outside of a 150 foot shaft and some surface pits, and needless to say, the company failed.

The Lake Fotune Mining Company took over the property at this juncture, and made some more mistakes. The Union Abitibi had made only a flying jump at milling. Periodical salvage operations were more in evidence than efforts to attain to gold production. There was just enough gold to entice the respective owners to do those things they should not have done. Professor Bancroft, Mr. Dresser, the Geological Survey, Supt. of Mines Denis, and those who had given the geology adequate thought, never faltered in their belief that Quebec would produce gold mining areas. Undoubtedly the country has been and is inaccessible, but it is no more so than other fields were. The factor of inaccessibiity did not weigh too heavily upon some of the pioneer gold mining organizations in this part of Quebec. They built mills before they had

Saw-mill and Power-house on Lake Fortune

ore. The Lake Fortune Mining Company is an outstanding example of over-optimism. The $400,000 spent (or raised) by its former owners is represented in the almost fully-equipped mill, the excellent sawmill and the modern machinery. What work was done is a sad commentary upon those responsible for it.

This company, of course, suspended operations as well. The property went under the hammer, and was acquired by Messrs. George Bonner, J. H. Goyer and some Montreal colleagues. These did not continue the wasteful policy. They acquired the property and premises at a liquidator's sale, tried to make them attractive to those who know more about the economics of mining than they do themselves, and for five years they have hoped someone

Battery of Tremaine Stamps in Lake Fortune Mill

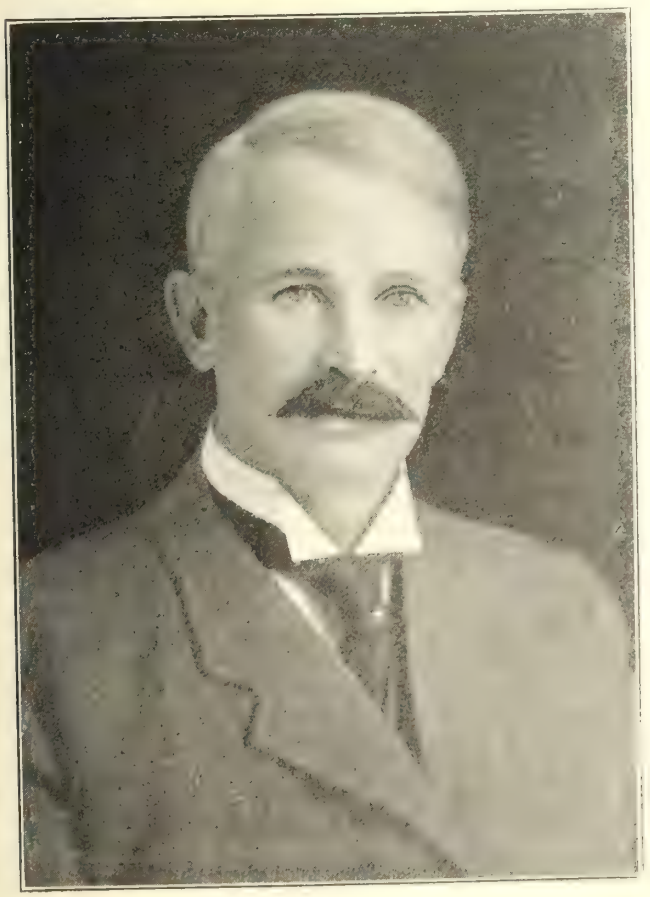
with vision and judgment would come along and do what Mr. Mackay and Mr. Alderson have done. They have a water power right that may be useful. Their mills and machinery require only slight additions to make them useful. Messrs. Alderson and MacKay have given the company the talismanic touch. Messrs. Bonner and Goyer hung on and may be enabled to hand out substantial returns to themselves and the shareholders in general.

Three months ago Messrs. Alderson and MacKay took a working option on a majority of the Lake Fortune shares. They were encouraged to do this by the favourable reports on the property by Mr. Dresser, Dr. H. C. Cooke, and others who had examined it. The terms called for certain expenditures over a three-year period. The first examination was disheartening. In spite of some spectacular showings, the returns from 150 channel samples from the old workings did not warrant the extensive operations at first contemplated. As Messrs. MacKay and Alderson, who were spending their own money, were obviously competent judges and thoroughly in earnest, Messrs. Bonner and Goyer extended the option and revised the terms. Mr. MacKay returned to re-examine the property—and made the find within a week. He has returned to the property to continue the work on what may prove to be the first gold mine in Northwestern Quebec.

R. H. FLAHERTY PASSES

On Wednesday, August 15th, Robert Henry Flaherty died at his home in Port Arthur, Ontario, aged 67 years.

Mr. Flaherty was born in 1856 at the Toltic copper mine in Michigan, where his father was engaged in the designing and construction of shaft-houses for various iron and copper mines throughout the State. He spent his childhood in Houghton, and grew to manhood in Marquette. Entering his father's employ at an early age, he mastered the millwright trade. While engaged later as superintendent with a contracting firm in Minneapolis, he attended night classes in mining engineering at the University of Minnesota.



The Late R. H. Flaherty

Mr. Flaherty's iron mining career began at the Chapin Mine, Iron Mountain, Michigan, and continued from that state into Minnesota when the Mesabi range was opened up. He took the first steam shovels to the Mesabi range in 1892, into what was then an unbroken wilderness.

His first experience in Canada was at the Foley Mine, at Mine Centre, from which he produced $200,000 in gold. Later he put down the Burleigh shaft in the waters of Lake of the Woods, searching for the Sultana vein. Later he returned to Mine Centre, operating the Golden Star Mine until it was closed down in 1899.

In 1900 he was placed in charge of the United States Steel Corporation's operations in Canada, and with a large staff of engineers and prospectors began extensive investigations on the iron ranges of Ontario. A thorough search was conducted at Steep Rock Lake, Atikokan, Mattawin, Kaministiquia, Loon Lake, Nepigon, Onaman, Poplar Lodge, Little Long Lake, and other localities. He continued at this work, with headquarters in Port Arthur, until the Steel Corporation discontinued its efforts in 1910.

In 1910 Mr. Flaherty became consulting mining engineer to Mackenzie, Mann & Co., of the Canadian Northern Railway, in which capacity he was required to travel the mining regions from coast to coast. He remained in this position until they closed their mining department in 1915. Since that time he has been employed as consulting engineer by various interests in the United States and Canada, his headquarters being in Port Arthur.

A widow, one daughter and three sons, Robert J., David and Arthur, survive. "Young Bob" is well known in Canadian mining circles, particularly on account of his explorations in Belcher Islands and the interior of Ungava, which he has deserted for the "movie" world.

Mr. Flaherty's death leaves a sad blank in the minds and hearts of a host of friends in the United States and Canada. His broadly human outlook and his cheerful disposition resulted in deep and lasting friendships. His knowledge of mining affairs, particularly of Canadian iron ores, made him an authority in his professional work. All of us, his friends, regret his passing, and will long hold his memory in esteem.

J. J. O'Connor.

RARE EARTHS MINERALS

These are a group of minerals containing uncommon oxides of an earthy nature; they are found in pegmatite dikes, and in the sand and gravel formed by the weathering of these rocks. In panning for gold, a heavy tail of red, yellow, orange, black, or white mineral should be tested for this group. Zircon, monazite, thorite, gadolinite, allanite or cerium epidote, columbite, and tantalite, are the principal minerals of the group. From them are extracted substances used in the manufacture of gas mantles, electrodes for arc lamps, ferro-cerium for gas lighters, and mesothorium which is similar to radium and used for the same purposes. Columbite and tantalite yield the metal, tantalum, worth $18 an ounce. From monazite and zircon is extracted the metal zirconium, used as a hardener for steel. Zircon concentrate sells for $100 to $400 a ton, and is used largely for making a refractory lining for furnaces.

Welfare Work at Anyox

By F. M. KELLEY*

Anyox is located on the north shore of Granby Bay, on Observatory Inlet, the easterly branch of the Portland Canal. It is five hundred and sixty miles north of Vancouver and a hundred odd miles from Prince Rupert, its nearest neighbor city. It is the industrial as well as the operating centre of the Granby Consolidated Mining, Smelting and Power Company, which is not infrequently referred to as the greatest producer of copper under the British flag. Some twenty-four hundred people at present call Anyox home. Some of them have been here since 1910, when Granby first acquired the Hidden Creek properties, which are the main source of the ore that keeps the smelter operating. The smelter was started in 1910, and has been in continuous operation, with the exception of three short periods, ever since. The mine is located about one mile from the waterfront, where the main portion of Anyox town is situated between the Coke Plant and the Smelter units. Between the Beach section and the Mine section of the community a considerable rivalry has always existed; and while this rivalry does not affect the efficiency apparent on every hand, it is largely responsible for many rattling good games of the kind indulged in by ardent athletes.

The Problem of the Isolated Community

In most centres of this kind, remote from cities and their advantages, the problem of an industrial concern is to make conditions as liveable as possible for its employees. The ordinary procedure is to furnish certain facilities in the shape of ball grounds, dance hall, gymnasium and picture theatre for the relaxation of the men on the job. In most cases each man is assessed monthly a certain sum, which is deducted from his time check, and an official of the Company, connected with the town management or facilities department, invariably acts as a welfare agent. As a rule, where welfare work is attempted at all, the employee has very little to say about what shall be done or to what extent it shall be done. It is not so in Anyox, where a new scheme is being tested, and where its success or failure will depend almost entirely upon the members of the community. Just such an organization as has been built up here it would be impossible to duplicate in other places; and while undoubtedly not altogether perfect as yet, its initial success would seem to indicate already that the effort is in the right direction.

Co-operative Venture at Anyox

The Anyox Community League comprises at present an active membership of five hundred employees of the Granby Company, the appeal of the League's various activities being the only incentive for these members to contribute voluntarily the monthly fee asked. Formerly the membership of the League embraced a number of the men employed at the Mine, and there are still a number in that section who are consistent members; but last fall, on account of the thick mantle of snow lying between the Beach and the Mine during the winter period, the League built at the Mine a community hall, embracing concert, dancing, gymnasium and picture show facilities, and handed it over to a club organized at that time, and now known as the Mine Club.

Before the inception of the community league idea, private interests operated the picture show, pool rooms and dance halls, leasing the premises from the Granby Company. Under the régime of the Community League these activities are operated for the sole benefit of the community and prices are kept as low as possible consistent with the best interests of all concerned. The whole affair as now conducted is in the nature of a co-operative effort, the entire profits derived from the commercial sources being returnable to all in the shape of well-kept tennis courts, a modern library and reading room, children's playgrounds, ball grounds, band support, children's field days, winter parties and other entertainments.

Summer Camp, Gymnasium and Library

A popular effort last summer was the inauguration of a summer camp, twenty miles away at the head of Alice Arm, an unusually beautiful spot. There ten families a week were taken care of for a period of two months. It was the intention to continue this from year to year, and arrangements had been practically completed for the present season; but the owner of the hotel in which the camp was to be established, was caught trading in bootleg liquor and the hotel was closed pending the conclusion of the period of enforced detention that resulted. For next summer it has been suggested that the League build a number of small cottages, and very likely this will be done.

Another effort, equally as popular, was the construction of a gymnasium, 40 by 90 feet, well equipped with all necessary appliances, in co-operation with the Granby Company, who assisted materially with both these efforts as they do in the case of every ambitious proposal put forward by the League.

The library and reading room conducted by the League is in charge of a competent librarian, and has on its shelves many books of reference, a wide range of the classics and plenty of fiction, which is being continually added to; while the reading room has all the Coast papers, and the best Canadian, American and English periodicals. There is also the Granby Technical Library, which covers every phase of mining and the allied branches of engineering, and is available to anyone genuinely interested in the mining and smelting of metals.

Business Administered by Elected Council

A Council administers all the business pertaining to the recreational and social activities of the Camp. It is composed of twelve members, elected by ballot. The active secretaryship of the League entails supervision of all the activities fostered by the organization, including picture shows, billiard and pool rooms and soft drink and tobacco stands. The Secretary of the League is the Welfare Agent of the Granby Company.

The general policy of the League is to make Anyox a better place to live in, and the scheme of co-operation it fosters might well be applied to other small communities throughout the country, as well as to the large industrial concerns. By such a means, at very little cost, the welfare of the people might be attended to. A contented community solving its own social and recreational problems without the aid of advantages offered by a city, is worth striving for. In the case of Anyox this ideal would seem to be well on the way to attainment

The Norwegian nitrate factory at Tyssedal, which was closed in 1921, has been converted to the manufacture of aluminium, and will re-open shortly.

* Secretary, Anyox Community League.

Natural Gas and Petroleum Resources of Western Canada

The Importance of the Gas Fields and Characteristics of the Gas

By NEWTON W. EMMENS

Before taking up the subject of the recovery of gasoline from natural gas, and the processes now in commercial operation for doing this, it might be well first to review briefly what is known at this time of the natural gas resources that by development would be made commercially profitable; and, secondly, to discuss just what natural gas is and in what manner gasoline is contained in it.

If we take the map of Alberta and locate on it the places where natural gas has been shown to exist by the drilling of wells, we find that they are many, are at long distances apart, cover a vast area of country, and, with the exception of the Okotoks, Peace River, Medicine Hat, Bow Island and Viking fields, have not had a sufficient number of wells put down to determine definitely either the extent or the productivity of the reservoirs in each locality. The following are such places:—

Monitor	Tp.	32	R. 4. W of the 4th Meridian.
Czar		40	7
Ponoka		43	25
Fabyan-Wainwright		45	7 & 8
Wetaskiwin		46	24
Camrose		47	20
Birch Lake		50	12
Tofield		50	19
Vegreville		52	14
Victoria		58	17
Morinville		56	25

These "fields" are all within easy reach of railway transportation and if sufficient gas of the right quality can be obtained they would form the basis of profitable enterprises.

Use of Gas Would Aid Search for Oil

It must be remembered that the wells in question were drilled primarily in the search for oil and, there being no immediate market for the gas, as such, no attention has been paid to it, the owners of the wells not realizing that natural gas can be used profitably not only for its gasoline content but for the manufacture of carbon-black, and that they do not have to depend on the domestic consumer or the factory owner in order to turn it to account. It is to be regretted that the development of these fields has not been pushed more vigorously and plants installed to utilize the gas, not only because such a policy would add to the prosperity of the community and turn a present loss into an asset, but because the information gained in the drilling of additional wells would define definitely the sub-structure, would enable the extent of the "pool" to be determined, and might lead to the discovery of oil in paying quantities.

It is a well-established fact that one or two wells neither make nor condemn a prospective field when they are drilled in new and untried territory, the geology of which is not worked out in detail, and where a producing "sand" has been found in the wells, even though the "sand" may not contain a commercial flow at the point where the drill penetrates it. The Kevin Sunburst field of Montana is a good example of this. In this field the first well was drilled about 1912 in Sec. 25, Tp. 34 N, R 3 W., and was carried to a depth of 1,755 feet, passing through the "sands" without getting commercial production. All that was encountered in this well was several small flows of gas in sands of the Colorado shales and a "show" of oil. The second well was drilled in 1922 (some ten years later) in Sec. 16, Tp. 35 N, R 3 W., getting commercial oil production at the top of the Madison limestone, and like the first well got small flows of gas in the sands of the Colorado shales. Since then there have been some 95 producing wells completed, 12 of which are gas wells, in addition to 24 dry holes, and there are 50 wells being drilled, with 33 rigs and new locations.

Geological Maps Defective

The work of the U. S. Geological Survey has been of the greatest assistance to the operators in the Kevin-Sunburst field. It was their investigations that discovered the existence of a structural fold favorable to the accumulation of oil and gas. This was followed up by the detailed work of private geologists, upon whose advice the first producing wells were drilled, so that the success of the Kevin-Sunburst field is directly due to the science of geology.

One of the greatest needs in the development of the natural gas and petroleum resources of our own west, second only to adequate capital, is accurate geological maps, as there is very little known over large areas about the detailed character of the rocks, their distribution or structure, and what information is available is conflicting. One report issued by the Geological Survey of Canada states that a broad anticline traverses east central Alberta, which is shown on the geological maps and is spoken of and shown in cross section by F. G. Clapp in his report to the Mines Branch of the Department of Mines, on "Petroleum and Natural Gas Resources of Canada"; while another report issued by the Geological Survey states that no such anticline exists but that the structure is that of a monocline. Inasmuch as the attitude of the strata has an important bearing on the probable location of oil and gas reservoirs, it is important that geological information be correct. In such a case as that above cited the only thing for the operator to do is to have accurate maps made by his own geologist before doing much drilling, which adds materially to the cost of development, and is almost prohibitive to the smaller companies or to the private operator.

Geological Advice Important

Up to the present by far the most important gas fields developed in east central Alberta are those of Viking and Irma-Fabyan-Wainwright, and of these two only that at Viking has been drilled systematically. It has a record of ten wells, all of which are productive and have "open flows" of from 2,000,000 to 7,000,000 cubic feet each per day. This gas comes from the sandy members at the base of the Colorado or Benton shales near the bottom of the Cretaceous formation. In the Irma-Fabyan-Wainwright field, as stated in a previous article, only three wells have been drilled (two more are being drilled now), which found gas at the same geological horizon as those at Viking and having initial "open flow" productions of from 6,000,000 to 10,000,000 cubic feet per day.

The wells at Ponoka, Wetaskiwin (2), Camrose, Tofield (3), Vegreville (3), Victoria and Morinville, encountered relatively small flows of gas in the Belly

River and Niobrara rocks of the Upper Cretaceous system at a considerably higher geological horizon than that containing the big producing sands of the Viking and Irma-Fabyan-Wainwright fields.

Definite and detailed information as to the yield of gas from the Monitor, Czar and Birch Lake fields is not available, but from their location in respect to the geology and what imperfect knowledge we at present have of the sub-structure, it would appear that they are favorably located and if developed should become important producing fields. However, before any large amount of money is expended in drilling, detailed geological investigations should be made so that the most favorable drilling sites, based on the local structures, may be selected and the unnecessary waste of money avoided. The importance of obtaining advice from a competent geologist or petroleum engineer (the latter must of necessity be an oil and gas geologist) is not confined to the information as to where to drill. It is just as important to know where *not* to drill; and while the geologist may not always select the spot where maximum production may be obtained, he is always sure of places where no oil or gas in commercial quantities can exist and where vast sums of money would be saved if he were more generally consulted and his advice followed before drilling. As examples we have only to recall the money literally thrown away in drilling for oil and gas at such places as Pitt Meadows, the Frazer river delta, on Graham Island and other places within the influence of the Coast Range Batholith, and in parts of the "disturbed belt" of Southwestern Alberta, where the rocks are so intensely folded and faulted that the likelihood of finding oil and gas reservoirs in them is almost nil.

Summary of Alberta Occurrences

Taking into consideration all the information available regarding the geology, sub-structure, and petroleum bearing (both gaseous and liquid) strata in Alberta, we can arrive at the following conclusions:

Gas exists in the shales of the Upper Cretaceous measures above the horizon of the Niobrara sandstone in comparatively small quantities, and such wells are not likely to be commercially successful for either gasoline or carbon-black production.

At the base of the Upper Cretaceous and at the top of the Lower Cretaceous measures, from the Niobrara standstone to the Dakota, there exist "sands" that contain tremendous reservoirs of natural gas and probably oil "pools".

It is probable that the Dakota sands can be reached at less depth in that part of east central Alberta extending from the Alberta-Saskatchewan boundary in the vicinity of latitude 52° N and extending in a northwesterly direction just beyond Vegreville and for an approximate distance of five to ten miles north and south of this line. Detailed geological investigations should, however, be made of the proposed drilling sites before actually commencing work within this area, as local conditions probably will be found to exist having an important bearing on the selection of the most favorable places. In this connection it is interesting to note that the rocks of Cretaceous age contain oil and gas reservoirs in the following States: California, Colorado, Louisiana, Montana, Texas and Wyoming.

Not All Gas is Petroliferous

We now come to the second question namely, What is natural gas?

The Encyclopaedia Britannica states that "natural gas is the name given to inflammable gas occurring in petroliferous formations". This is the popular understanding; but is by no means to be applied to all gas that comes from the ground, because many of these gaseous emanations are not petroliferous at all, but are chiefly composed of nitrogen, carbon dioxide, hydrogen sulphide and methane or marsh gas. As examples we may cite the following:—

Nitrogen — the well at Pitt Meadows in British Columbia yields gas that is 99% nitrogen, and the gas from the well on Pender Island, also in British Columbia, consists almost entirely of that element.

Carbon dioxide — In New Zealand the well at Kotuku yields a gas that contains 57% carbon dioxide, the well at Rotorua 79.9%, and the No. 3 bore at New Plymouth 81.7% of that gas.

Hydrogen Sulphide — The gas from wells in Mexico and some of the Gulf coast fields contains sufficient hydrogen sulphide to make the gas very poisonous.

Methane, or Marsh gas. — This gas is of widespread occurrence and is the chief gaseous constituent of all natural gas of the hydrocarbon series, but does not necessarily indicate the presence of petroleum in the containing rock unless accompanied by condensable petroleum vapors. Methane is the only hydrocarbon contained in the gas from the wells of the Caddo field in Louisiana, at a few places in Oklahoma, from the Murraysville sand of Pennsylvania, from some of the Texas fields in Ontario, in the Medicine Hat field of Alberta and at a few other places.

Methane Often Mistaken for Natural Gas

Not only is methane found in the underlying rocks but it is of common occurrence in marshes, along the shores of lakes and in the islands and deltas formed by streams and rivers. In British Columbia notable examples of this are to be found in the vicinity of Arrowhead, where the Columbia river enters the Arrow lakes, depositing its silt and forming a delta. Here it is common to see streams of gas bubbles rising through the water along the shore line and at some distance out in the river and lake where the water is shallow. This gas is caused by the decomposition of vegetable matter, brought down in the sand and silt by the river, under the water. Similarly the methane can be seen rising around Kamloops lake, in the Fraser river delta and at many other places where there are swamps and where vegetable matter is decomposing.

In most places where marsh gas occurs — that is in swampy places — there is on the surface of the puddles of water a scum or film that shows rainbow colors which the layman is prone to take as being caused by oil, whereas it has absolutely nothing to do with petroleum but is a film of the iron oxide almost always found in unused wells, around bogs and in springs from marshy ground. The iron films are easily recognized because they break apart into irregular figures when stirred with a stick, whereas an oil film will not do this but will spread out along the surface of the water without breaking. The presence of this iridescent iron film and the occurrence of inflammable gas (marsh gas) has been responsible for the waste of much money in the useless drilling of wells for oil and gas in localities where they could not possibly occur and where all geological evidence points to this fact. Methane from the decomposition of vegetal matter in the unconsolidated surface deposits is never as pure as that coming from deep-seated rock strata, but is accompanied by more oxygen, as will be seen from the following analyses:—

	Rock gas	Marsh gas
Methane	[illegible]	[illegible]
Ethane	[illegible]	[illegible]
Carbon dioxide	[illegible]	[illegible]

Carbon monoxide	0.50	0.00	0.0	0.0
Hydrogen	2.18	0.00	61.3	0.0
Nitrogen	3.60	0.00	2.2	1.4
Oxygen	0.35	0.00	5.0	3.5
Sulphuretted hydrogen	0.00	0.51	0.0	0.0

Characteristics of Natural Gas

Petroleum gas, the "natural gas" of commerce, as distinguished from the methane gas from rock strata above referred to, consists of methane, ethane, propane and butane in varying proportions according to the "field" from which the gas comes as well as the individual well in that field. It is rarely that the gas from two wells in the same field from the same sand has exactly the same analysis. In addition to the above-mentioned gases, petroleum gas is often accompanied by vapors of the more easily volatilized portions of the oil associated with the gas or contained in the strata through which the gas passes on its way to the surface. It is these vapors, plus most of the butane and a good part of the propane, that are condensed and recovered in the form of gasoline when the gas is treated appropriately.

Methane, ethane, propane and butane belong to the hydrocarbon series of gases and consist of carbon and hydrogen, with the following characteristics:

Name	Percent Carbon	Percent Hydrogen	B.t.u. per cubic foot	Specific Gravity (air = 1)
Methane	74.97	25.03	1065	0.553
Ethane	79.96	20.04	1861	1.037
Propane	81.80	18.20	2654	1.520
Butane	82.80	17.20	3447	2.004

None of these hydrocarbons are liquid at ordinary pressures and temperatures but both propane and butane can be liquified and will remain liquid to a considerable extent if mixed with naptha or low gravity gasoline.

Gasoline Vapor in Natural Gas

It is well-known fact that when a gas comes in contact with, or bubbles through, a liquid, it takes up and carries along minute particles of that liquid in the form to which we have given the name vapor. The amount of vapor a gas will take up and transport depends upon the temperature of the gas and is quite independent of its nature so long as no chemical action takes place between the gas and the vapor. If this vapor-laden gas comes in contact with some cold object, or if its temperature is reduced, it will deposit the excess vapor in the form of a liquid and the gas will retain only the proportion of vapor it can carry at that particular temperature. We have a good illustration of this when, on a warm, damp day, we bring into the air some object that is cold, such as a jug filled with iced water, immediately becomes covered with water that has been extracted from the surrounding atmosphere by condensation due to the lowering of the temperature of the moisture-laden air in contact with the cold object. Another illustration is warm moisture-laden air blowing in from the sea and coming in contact with the colder air from the land, which causes a general reduction in temperature of the warm air and the precipitation of its moisture in the form of rain.

Reducing the temperature of the air is not the only way of extracting its moisture. The same object can be attained by compressing the air, or it can be passed through some medium, such as calcium chloride or sulphuric acid, that has a great affinity for water.

What is true of air and water vapor is equally true of natural gas and the vapors of the more easily volatile portions of petroleum.

Reduction of Rock-Pressure Gives More Gasoline

Oil or petroleum, like natural gas, is not a liquid of uniform composition but is made up of a number of the hydrocarbons that are liquid at ordinary pressures and temperatures, such as pentane, hexane, heptane, oxane, nonane, etc., each of which has one more carbon atom and one more hydrogen atom than its immediate predecessor in the series, and has a different boiling point. If, then, we bring gas into contact with petroleum, or with rocks that contain petroleum, it will pick up and carry along with it the vapor of that part of the liquid that volatalizes most readily at the temperature and pressure of the gas, until it becomes saturated. As the pressure of the gas on the petroleum is reduced, the boiling points of the component petroleum hydrocarbons are lowered, allowing the lighter members to vaporize more readily. It is due to this fact that as the pressure of the natural gas in the well decreases its gasoline content increases. In one field in West Virginia the gasoline content of the gas increased from 300 gallons per million cubic feet to 900 gallons per million, and in Pennsylvania the gas from a Clarion County field increased from 200 to over 800 gallons per million. Both these increases were directly due to the increased gasoline content of the gas caused by the reduction of pressure and consequent lowering of the vaporization point of the gasoline fractions of the oil in the rock.

The gasoline vapor carried by natural gas depends upon the petroleum content of the "sand" from which it comes, as well as upon the pressure, that derived from wells that also produce oil being very much richer in gasoline than that from wells that yield gas only. This gas is spoken of as being either "wet" or "dry". The "wet" variety may contain from one to as high as twelve gallons of gasoline per thousand cubic feet, while the "dry" variety is what contains less than one gallon per thousand cubic feet, down to as low as one-tenth gallon. The process for recovering the gasoline from natural gas depends upon the richness of the gas and its analysis. A description of the different processes and their operation will be given in the next article.

PETROLEUM PARAGRAPHS

Owing to the overproduction of crude oil in the United States, prices have been reduced from time to time till the producer in many districts is finding it not only impossible to operate at a profit, but difficult to avoid losses. The result of this is that many wells are being shut in and there is a talk of several of the refineries being closed down till the situation improves. As a result of this curtailment policy the production of crude oil in the United States has declined 45,278 barrels for the week ending July 21st. This is the first time since last February that an increase has not been registered.

The following are the prices for crude oil now prevailing:

California	$0.60 to $1.04
Wyoming	0.95 1.70
Gulf-Coast	1.05 1.50
Mid-Continental	1.10 2.20
Central States	1.05 1.88
Eastern Fields	0.75 3.00
Sunburst, Mont.	0.70
Canadian, Petrolia	2.28
Canadian, Oil Springs	2.35

The High Prairie Oil & Gas Co. is drilling a test well along the Peace River, in the Lesser Slave Lake region. The hole is being drilled with standard tools and is down 200 feet. An encouraging geological report has been made on the district and oil is expected to be found at a depth of 3,000 to 3,500 feet.

The Imperial Oil Company's well in the Pouce Coupé district, Sec. 23, Tp. 80, R 13 W of the 6th meridian, northeastern Alberta, has been discontinued at a depth of 2,657 feet without finding commercial production of oil. This well did, however, find a gas sand at a depth of 1,650 feet which gave an initial output of about 10,000,000 cubic feet daily. The well is being left in shape to produce gas.

In the Fabyan-Wainwright district, Alberta, the British Petroleums Ltd., are drilling their No. 2 well in Sec. 36, Tp. 45, R 9 W of 4th meridian, and the Imperial Oil Co. are drilling their No. 2 Grattan in Sec. 14, Tp. 45, R 8 W of the 4th Meridian.

The Northwestern Utilities Co. have finished their No. 10 gas well in the Viking field, central Alberta, and are reported to be bringing in another set of tools to drill and test the southern part of the Viking field for oil.

The Imperial Oil Company's test at Red Coulee in Sec. 5 Tp. 16, R 46 W of 4th meridian showed a production of only one barrel per day from the oil sand at 2,525 feet; consequently a string of 6-inch casing has been run, shutting off all water, and the well is being drilled deeper. It is now down 2,600 feet.

THE "TIN HAT" IN MINES

The trench hat, the "old tin hat" that served in some measure to turn shrapnel hail on the war-swept fields of France, is coming into quite extensive use as a means of head protection against falls of rock and ore in the mines of California, West Virginia, Oklahoma and many other states, according to R. V. Ageton, metal-mining engineer of the United States Bureau of Mines. The hats are being used in shaft sinking and in raising operations and around and in hoisting shafts, states Mr. Ageton. The "trench shoe" and similar heavy shoes are also being utilized by miners to protect their feet.

The Cornish miner of earlier days, who has left his mark in nearly every metal mining camp of the United States, usually protected his head with a hard resined felt hat, on which was stuck a candle, the candle being held in place by a gob of mud. The hat was hot, heavy, and cumbersome, but long years of mining experience had impressed on the Cornishman the wisdom of protecting his head from bits of falling rock. His heavy, cumbersome, cowhide boots, with soles half an inch to an inch thick, undoubtedly prevented many an accident to his feet.

Stiff protective hats are still widely used in some mining districts, but in general the custom of wearing stiff hats is not nearly so common in mines of this country as it should be, probably because a large proportion of the foreign-born miners, as well as many American-born miners, now come to the mines from other occupations, without previous knowledge of mining, and do not appreciate the importance of protecting the head and foot from minor accidents. In recent years, however, the Bureau of Mines has noted a gratifying increase in the use of protective devices for the head by the miners of the country. Many of the soldiers had been miners, and came back with a wholesome respect for the trench helmet and the trench shoe. After being discharged, numbers returned to the mines, and brought with them the trench hat and the thick trench shoes. As one miner in an Oklahoma zinc mine expressed it, "If 'the old tin hat' would stop shrapnel, I reckon it'll stop these small pieces of 'jack.'"

Both miners and operators have been quick to recognize the advantages of these war-time devices for mining use, and at least one mining company was so impressed that it bought a large quantity of trench hats and distributed them to its employees.

ONTARIO'S GOLD PRODUCTION

Statistical returns received by the Ontario Department of Mines from producers of gold in the Province for the six months ending June 20th, 1923, are tabulated below.

For the corresponding period in 1922 the output was 476,338 ounces of gold and 76,405 ounces of silver worth $9,899,193. The decrease was due to an acute shortage of hydro-electric power during the first four months of the year. This situation has been remedied by the completion of additional power plants on the Mattagami and Montreal rivers, while other hydro-electric plants to serve Ontario's gold mines are now under construction on the Quinze and Abitibi rivers. With ample power available, increased milling capacity at both Porcupine and Kirkland Lake and the addition of new producers, it is expected that production of gold in Ontario for the full year 1923 will be considerably in excess of the 1922 output of one million ounces.

GOLD PRODUCTION — FIRST HALF OF 1923

Source	Ore Milled Tons	Bullion Gold Ounces	Bullion Silver Ounces	Total Value $
PORCUPINE				***
Clifton-Porcupine	9,20	[illegible]	37	[illegible]
Dome	166,900	94,744	[illegible]	[illegible]
Hollinger Consolidated	[illegible]	[illegible]	34,136	[illegible]
McIntyre	[illegible]	47,793	16,277	[illegible]
Total	[illegible]	348,446	65,444	[illegible]
KIRKLAND LAKE				
Kirkland Lake Proprietary (1919)	1,803	[illegible]	[illegible]	[illegible]
Kirkland Lake	[illegible]	[illegible]	[illegible]	[illegible]
Lake Shore	11,457	14,431	1,040	[illegible]
Teck-Hughes	[illegible]	27,048	1,869	[illegible]
Wright-Hargreaves	[illegible]	20,405	2,328	381,214
Total	[illegible]	69,691	[illegible]	1,402,873
Nickel-Copper Belt		347		[illegible]
Grand Total	[illegible]	418,484	71,959	[illegible]

*** In addition to the values given mines reported receiving for bullion marketed $60,269 by way of exchange premium.

TAR SANDS FOR ROADS AND WALKS

A new demonstration of the practicability of using the tar sands from McMurray, north of Edmonton, for sidewalk and road purposes, is being made at the Edmonton Exhibition. A sidewalk has been laid on the exhibition grounds comprising crushed gravel and the tar sand just as it comes from the ground. It is hoped that such experiments as these will demonstrate the value of the McMurray tar sands in road making. The section of road in Edmonton surfaced with the bituminous sand by S. C. Ells of the Geological Survey some years ago has already proved the value of this material for road building.

MINING AND METALLURGICAL RESEARCH

In his valedictory address as President of the South African Institution of Engineers recently, Mr. J. W. Kirkland made an eloquent plea for more research in mine and mill, which he calls "constructive economy". "I am of the opinion," he said, "that much true economy is attainable as the result of research in connection with gold mining." He gives a list of problems requiring solution, which touch all departments of gold mining and milling.

The Collieries of British Columbia

V — The Nicola-Princeton Field; Coalmont Collieries

BY ROBERT DUNN

The Nicola-Princeton coal field of British Columbia is in the southern interior, between the Fraser River and Okanagan Lake. Dr. G. M. Dawson classified it as a part of the great interior plateau. Of the demonstrated commercial fields of the Province it is the least developed and much more exploration work will have to be done before a clear idea is obtained of its economic possibilities. At present, in point of production, it ranks third in relation to the other two productive areas. In 1922 its total output was 270,890 tons, less than half that of the Crow's Nest, and a very small part of 1,754,656 tons which was the total for the collieries of Vancouver Island.

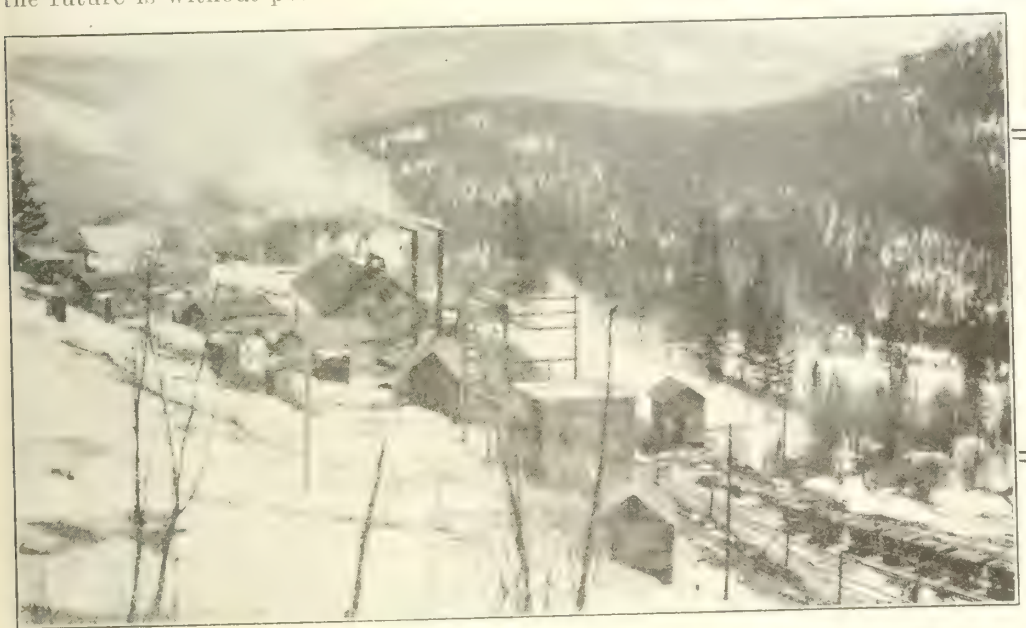
Nicola-Princeton Field of Growing Importance

It would be a mistake, however, to arrive at the hasty conclusion that, because the Nicola-Princeton section has not made marked progress in coal mining, the future is without promise. There is no doubt that there are large reserves of a good quality of coal in this part of the Province. The district has the further advantage of being comparatively close to a rapidly growing and broadening market. It is tapped directly by the Kettle Valley Railway, and Coalmont, for instance, is only some 170 miles east of Vancouver by railway. Probably the lack of a steady demand in the past, owing to the competition of the coals of Vancouver Island, has retarded the advance of mining here; but, as was stated in a previous article, the workings of the Vancouver Island mines are becoming extended, overhead expense for this and other reasons is mounting, it is becoming necessary to open up new parts of the Island field, and as the supply from the Island diminishes and increases in cost of production there can be no doubt that the Nicola-Princeton coals will command more and more attention. Consequently it is clear that the coal resources of the Princeton-Nicola-Kamloops zone are of vital importance to the Province and that their value economically will be recognized in greater degree as the Province grows in population and its industries expand.

Geology of the Coal Basins

Dr. Charles Camsell, Deputy Minister of Mines, Ottawa, when an officer of the Geological Survey, made a detailed geological examination and report on the district. He said that in the valley of the Similkameen River at Princeton, Tertiary coal-bearing rocks occupy a depression in Palaeozoic and possibly Mesozoic strata. This basin contains an important reserve of coal. He described the formation as follows:

"**Oligocene.** — These sedimentary rocks alone in the northern part of the district cover an area of nearly fifty square miles, the basin being fourteen miles long with a variable width of from three to five and a half miles. They consist of thick beds of sandstone with clay, shales and several seams of lignite.



Mine at Blackburn, Coalmont Collieries Ltd.

The base of the series appears to be a very coarse grained sandstone containing many large, rounded, white feldspars in a matrix of calcareous material. This rests on the eastern side of the basin of the Copper Mountain series of rocks, while on nearly all other boundaries the sediments dip under the more recent volcanic rocks which lie as sheets on them. In parts also these volcanics have thrust themselves through the sediments and now appear as islands in the older rocks. The strata do not lie horizontally but have been tilted at low angles, making an irregular series of folds; some faults also occur."

In view of the recent activity at Coalmont Dr. Camsell's observations on the Tulameen measures are of interest. He says:

"The coal basin is almost circular and is occupied by sandstones, shales, clays, and coal-seams. These rest conformably on volcanic rocks consisting of agglomerates, basalts and andesites and are in part covered by more recent volcanic flows. The rocks have

been tilted at low angles and on the outer borders of the basin appear to dip toward the centre. The angles are never more than 45 degrees and are generally less. Small folds appear on Collins gulch and in other places minor faults occur, but on the whole the disturbance is probably not great enough to seriously affect the mining of the coal. The rocks are determined from their fossils to be Oligocene in age and in consequence they are correlated with the coal basins of Princeton, Nicola, Kamloops and with other Tertiary lake basins of the interior of British Columbia."

Of the Nicola and Quilchena the same authority says:

"These two basins of Oligocene rocks occupy depressions in a series of volcanic rocks of Triassic age. The coal is highly altered and the occurrence of small patches of basalt, similar to that covering part of the field at Tulameen, shows that this area also was once covered by a similar outflow. The Nicola basin occupies depressions in two valleys at right angles to each other; a large basin on Ten Mile Creek is connected by a narrow valley with the basin in Nocal Valley; the Quilchena basin lies about eight miles to the east of the Nicola basin. The rocks dip toward the centre of each basin and are broken by minor faults. Superficial deposits mask all the exposures on the lower levels and are very thick in the vicinity of Nicola river."

Six Collieries in Operation

During the last year there were six collieries operating within the area defined, namely, the Princeton Coal & Land Co. Ltd., the Coalmont Collieries Ltd., the Middlesboro Collieries Ltd., The Fleming Coal Company Ltd., the Community Coal & Coke Co., Ltd., and the Chu Chua Coal Co. Ltd. Collectively they employed some 600 ment. Of the group the Coalmont Collieries contributed by far the greater proportion of the field's production, having an output of 142,806 tons. Next in order was the Middlesboro Collieries with 69,330 tons; then the Fleming Coal Co. with 38,485 tons and the Princeton Coal & Land Co., with 19,418 tons. The Chu Chua and Community Coal & Coke Co., followed with inconsiderable amounts.

Coalmont Collieries

Unquestionably the feature of the past year in this field was the showing made by the Coalmont Collieries, which is operating on the southwest side of a mountain on the north fork of Granite Creek at an elevation of 3,600 feet above sea level and 1,600 feet above the Tulameen Valley at Coalmont. The good results are due to the aggressive policy of development inaugurated by the management, composed of W. J. Blake Wilson, president; Gen. J. W. Stewart, vice-president; A. H. Douglas, secretary; D. J. McLeod, treasurer and Donald McLean, manager.

A large amount of exploratory work has been done by several companies and syndicates on this property since 1906. Until 1913, most of this was on the Coalmont side of the mountain, where the edges of the basin were found to be exposed on the "Frazer and Collins Gulch." It consisted chiefly of driving tunnels and boring into the mountain where the coal was found to be of an unusual thickness. It proved to be a high-grade bituminous with good steaming qualities. Unfortunately it is in a much disturbed area, the measures being badly crushed, contorted, folded and broken. Consequently operations were discontinued on this side of the mountain in 1913.

During the same year the Coalmont Collieries Syndicate bonded the property and commenced development at the surface croppings, which were exposed along the side of the mountain on the north side of Granite Creek and 5 miles distant from the town of Coalmont. Here the measures appeared to be comparatively undisturbed. The syndicate continued development until 1916, but owing to the war found it impossible to obtain the necessary capital.

Recent Developments

The property then was taken over by the Coalmont Collieries Ltd., which began development during 1917, following the same policy adopted by the syndicate of developing the measures on the Granite Creek side of the mountain. Motor trucks were employed to transport the coal from the mine to a siding on the railway, and by the end of 1918 the mine had produced and shipped 5,744 tons of coal from the main entries. The seam was shown to be continuous and the coal was uniform in quality.

During 1920 preparations were made for producing coal on a much larger scale by the installation of more plant and equipment. This included an aerial tramway for the transportation of the coal from the mine to the tipple at the foot of the mountain. As a result the Coalmont Collieries may now be considered among the more important of the mining enterprises in the Province. This is demonstrated by the following returns:

	No. of men employed	Output of colliery, tons
1920	36	8,983
1921	80	63,344
1922	143	142,806

The measures at present operated lie in a large basin, with a steep pitch near the surface croppings, which flattens out considerably towards the centre of the basin. All operations to date have been conducted in No. 4 Seam of the series, which is an excellent seam of bituminous coal with an average thickness of from 10 to 14 feet.

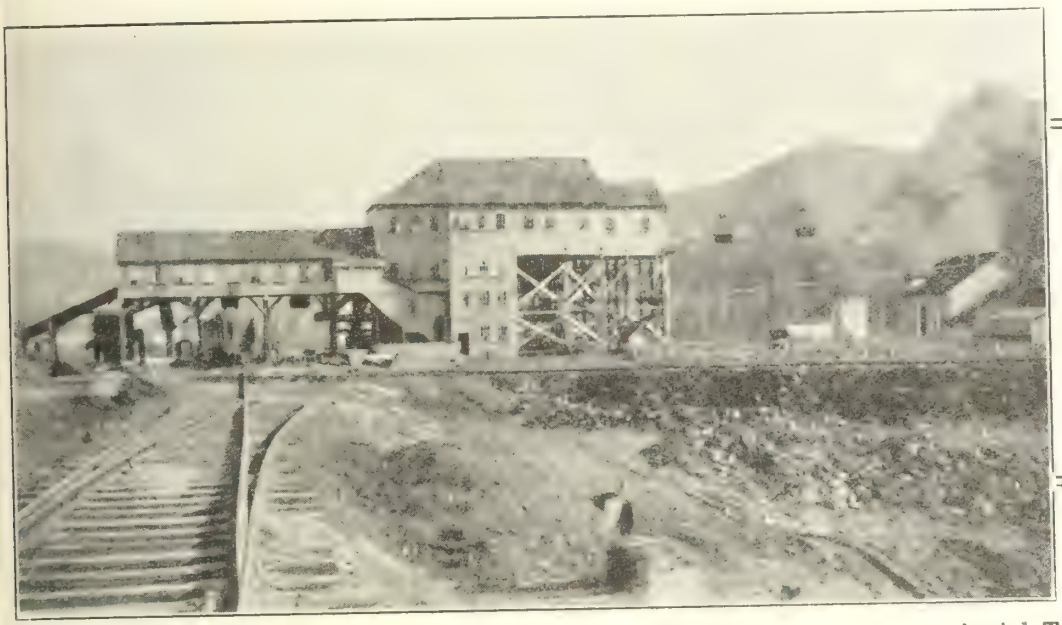
No. 2 Mine

The present mines have been developed by two large and well maintained levels, with the necessary counter levels for ventilation purposes. They are known as the No. 2 and No. 3 mines and are on the same seam of coal but are two entirely distinct operations, being separated by a thick pillar. No. 2 Mine has been developed by a pair of levels following the strike of the seam a distance of 3,250 feet. A large fault or dyke was encountered here and operations were discontinued at the face of this level. Seven sets of headings or chutes were driven from the main level, following the full pitch of the seam to the surface croppings, which are reached at a distance of 700 to 800 feet, the pitch of the measures varying from 20 degrees near the level to 60 degrees near the croppings. An opening then was made to the surface, known as No. 1 level, for facilitating the handling of timber for the working places and for ventilation purposes.

All the workings in this mine are to the raise side of the main level, and owing to the pitch of the seam the mine cars are not taken off No. 2 level. The stall or dump car roads are driven off the headings following the strike of the seam with the necessary crosscuts for ventilation, leaving the pillars about 50 feet square

The roads are 10 feet wide and are generally driven as far as some minor faulting, when the pillars are drawn back towards the main heading, this work being on the retreating system. This commences near the surface and the pillars are drawn towards the No. 2 level.

The coal is loaded at the working faces into small dump cars and is trammed by hand to the main headings, where it is dumped into steel-lined chutes. It runs by gravity to the foot of the chute on the level, is loaded into the mine cars as required and drawn in trips by horse haulage to the top of a surface incline. The cars are lowered over this incline to a siding near the entrance to No. 3 Mine, and there are collected by a 7-ton trolley motor and hauled to the top terminal of the aerial tramway.



Tipple of Coalmont Collieries, showing terminal of aerial tramway from the mines

No. 3 Mine

No. 3 Mine, generally known as the Wilson Tunnel, is the largest and most extensive opening of the Coalmont Collieries and is being used to develop the largest portion of this field. It is at an elevation of 3,600 feet above sea level and is on the same elevation as the top terminal of the overhead tramway. It is an 8 ft. by 12 ft., strongly timbered level with sets up to 24 inches diameter. It had followed the strike of the seam a distance of 3,500 feet when the same fault was encountered as was found in at the face of No. 2 level.

Practically all the work at present done in this mine is in the direction of the dip of the main level. The seam is being developed by three sets of slopes following the full pitch of the seam, which is found to flatten considerable as the slopes are advanced.

No. 1 slope has reached a distance of 1,000 ft., No. 2 about 500 feet, and No. 3 slope, 400 feet. Levels are driven at intervals of 250 feet, from which all the stalls are driven to the raise. The seam has a thickness varying from 8 to 14 feet.

The measures to the dip are under a thick overburden probably 1,100 feet, causing the working places and roadways to be subject to a great deal of "squeeze", for which reason the pillars are left as large as possible. All the working places are driven not more than 10 feet in width and are timbered with heavy framed sets.

The mine cars are collected at the working faces by horses and drawn to landings near the slopes and hoisted to the main No. 3 level by rope haulage. No. 1 slope is provided with a 150 H.P. electric hoist, No. 2 Slope with a 50 H.P. compressed air hoist and No. 3 slope with a 75 H.P. electric hoist. The mine cars are collected on the main No. 3 level by a 7-ton electric trolley motor and hauled in trips to the top terminal of the aerial tramway.

The mines are ventilated by a fan manufactured by the American Blower Company capable of producing 38,000 cubic feet of air a minute against a one-inch water gauge. A Sirocco fan of 100,000 cubic feet capacity is being installed at the entrance to No. 3 counter-level, which will be the permanent airway.

Aerial Tramway

The aerial tramway is 2½ miles in length with a difference in elevation between the upper and lower terminals of 1,600 feet. It is provided with a 1⅛" locked-coil carrying cable on the empty side and a 1⅝" track strand, smooth-coil cable on the full side, and a ⅞" traction cable. It is controlled by a 75 H.P. motor attached by belt and spur gearing to a Fowler grip pulley.

The power house is at Coalmont and is equipped with two water-tube boilers of 28,000 to 30,000 lbs. per hour steaming capacity, fitted with induced draft duplicate pumps and feed-water heating attachments. These boilers have cross-drum and horizontally inclined tubes and are considered the best type of boiler for a steaming plant. At the power house a 600-K.W., 500-volt electric generating plant is installed, with transformers where the voltage is brought up to 10,000 volts and taken over the mountain on high-tension cables to the mine, where it is again reduced to 550 volts for use.

ARSENIC

The United States Geological Survey announces that during the first six months of 1923, nine plants produced refined white arsenic to the amount of 6,035 tons, valued at 8.36 to 15 cents a pound, and 1,183 tons of crude arsenic, valued at 7.46 to 10 cents a pound. One plant at Salt Lake City made calcium arsenate direct from the ore. Imports during the first three months totalled 2,694 tons. Several new plants are planned to operate arsenic deposits in the Western States.

REVISED STATISTICS ON LEAD, ZINC, IRON ORE AND ASBESTOS

The Dominion Bureau of Statistics has issued under date of July 30th, the following finally revised statistics on the mineral production of Canada during 1922.

Lead

The production of lead in Canada during 1922 amounted to 93,307,171 pounds (46653.58 tons) which, at the average market price in Montreal for the year of 6.235 cents per pound was valued at $5,817,702 as against 66,679,592 pounds (33,339.8 tons) valued at $3,828,742 in 1921 when the average price was 5.742 cents per pound. The increase amounted to about 40 p.c. in quantity and 52 p.c. in value.

This production included: (a) 88,606.869 pounds of pig lead produced at Trail, B.C. and Galetta, Ontario; (b) 4,670,621 pounds, the estimated recoveries from lead ores and concentrates exported to the United States, and (c) 29,681 pounds estimated as recovered from ores and concentrates exported from Cobalt to United States smelters.

Production of Lead by Provinces

	Quantity Pounds	Computed Value
British Columbia	87,093,266	85,430,265
Yukon	3,323,508	207,221
Ontario	2,890,397	180,216
Total for Canada	93,307,171	$5,817,702

Shipments of Lead Ores and Concentrates from Canadian Mines in 1922

	Lead Ores	Lead Concentrates	Dry Ores
Tons shipped	17,245	8,823	998
Reported value of shipments	$599,425	754,370	12,388
Metal Contents of Shipments:			
Gold, fine ounces	70	234	8
Silver, fine ounces	1,285,348	611,843	19,922
Lead, pounds	11,245,579	9,363,313	4,264
Zinc, pounds	1,233,901		

Many of the ores of British Columbia contain both lead and zinc. Thus, in addition to the quantities noted in the above table there was 78,350,311 pounds of lead contained in zinc ores so termed because zinc was the predominating metal. Most of such shipments were from the Sullivan mine of the Consolidated Mining and Smelting Company.

Zinc

The production of zinc in the refined state at Trail, B.C. during 1922 accounted for the whole Canadian production and amounted to 56,290,000 lbs. or 28,145 tons which, at the average St. Louis price of 5.716 cents per lb., was valued at $3,217,536. During the year no mine operators reported having shipped zinc ores to the United States.

In 1921, the production was 53,089,356 pounds or 26,544.6 tons valued at $2,471,310 or 4.655 cents per pound on the St. Louis market. The output included 52,988,000 pounds refined zinc produced at Trail and 101,356 pounds, estimated as recovered from ores and concentrates exported.

The increase in 1922 amounted to 6 per cent in quantity and 30 per cent in value.

Shipments of Zinc Ores and Concentrates from Canadian Mines 1922

	Zinc Ores	Zinc Concentrates
Tons shipped	[illegible]	[illegible]
Reported value of shipments	$ 2,075,144	$ 282,570
Metal contents of shipments:		
Gold, fine ounces	19	26
Silver, fine ounces	3,315,505	186,584
Lead, pounds	[illegible]	47,284
Zinc, pounds	[illegible]	4,918,439

The above table is incomplete in respect to zinc in mine shipments since many of the ores in British Columbia contain both lead and zinc, and in the year under review, lead ores, so termed because they contained more lead than zinc, shipped from the mines were reported to contain 1,233,901 pounds of zinc.

Iron Ore

The total shipments of iron ore from Canadian mines during 1922 amounted to 17,971 short tons, the net value of which was reported at $56,993 as compared with 59,509 tons shipped in 1921 with a value of $230,164. This production was the lowest recorded during the past 21 years.

Asbestos

The total quantity of asbestos rock mined during 1922 amounted to 2,562,933 tons. Of this, 2,1[illegible] tons or 84.5 per cent. was milled and 158,023 tons of asbestos was recovered in a merchantable state. The sales for the year amounted to 163,706 tons, for which the producers received $5,552,723 or an average of $33.92 per ton. During the previous year, the average value per ton was $52.89.

The amount of asbestos sold in 1922 was 78 per cent. higher than in 1921, when only 92,761 tons was marketed. During the year, the Quebec Government reduced the royalty from 5 per cent. of the gross value of asbestos shipped to 2½ per cent., as a measure of assistance to the industry. The entire Canadian production was derived from the Eastern Townships of Quebec.

Output, Sales and Stocks of Asbestos in Canada 1922

Classification	Total Output Tons	Sold or Shipped: Total Quantity Tons	Sold or Shipped: Sales value	Sold or Shipped: Average	Quantity in stock, or held at mines at end of year Tons
Crude No. 1	759	[illegible]	[illegible]	[illegible]	1,463
Crude No. 2	2,190	1,351	[illegible]	[illegible]	1,703
Fiberized crude	120	528	[illegible]	[illegible]	[illegible]
Spinning stocks	11,030	6,539	[illegible]	[illegible]	[illegible]
Shingle stocks	18,587	19,647	[illegible]	[illegible]	[illegible]
Mill Board stocks	3,930	1,386	[illegible]	[illegible]	[illegible]
Paper stocks	13,196	14,175	[illegible]	[illegible]	[illegible]
Paper fillers	35,257	15,275	[illegible]	13.07	[illegible]
By-Products (Asbestos sand, finish floats)	12,954	13,412	[illegible]	[illegible]	[illegible]
Total	158,023	163,706	[illegible]	$ 33.92	[illegible]

THE MINING DISTRICTS

By THE JOURNAL'S CORRESPONDENTS

QUEBEC

Along with the good news from the Lake Fortune property at the western end of Quebec's northern gold belt, which receives special notice on another page, comes good news from the eastern end of the belt. The Stabell property, on lot 53, range 8 in Dubuisson township, on the upper reach of the Harricanaw River, has been under option to an influential group of mining men since last spring. These have just completed five thousand feet of diamond-drilling. Specific results of this drilling have not been made public, but the ore disclosed in the cores is understood to be thoroughly satisfactory, with every indication that here is a gold mine in the making. Machinery for sinking a shaft is now on the way to the property. The first scow-load arrived last week, consisting of a boiler, steam hoist and miscellaneous equipment.

Mr. N. C. Stines, representing the American Smelting and Refining Co., has examined recently a number of properties in the neighborhood of the Stabell and at present is sampling the Sullivan property on Lake Demontigny.

The Sisco Island and Dalton group of claims on Lake Demontigny have been optioned to the Quebec Gold Rand Limited, who propose to commence work on the claims immediately. This is the company with which the Duke of Manchester is associated.

The Union Mines Corporation, which holds lot 30, range 8, Dubuisson township, has had a small force of men at work under Mr. J. C. Yancey for some time. Diamond-drilling has showed that a promising ore-body outcropping at the surface continues to a depth of at least 400 feet. It is proposed now to erect a small mill to treat the ore so far disclosed. The property is held by a Chicago syndicate.

On the 17th inst. the Molybdenite Reduction Company, Ltd., shipped a 20-ton car of molybdenite ore from Amos to the Mines Branch of the Department of Mines, Ottawa, for testing purposes. Their property is located in Laconte township on the east side of Lake Malartic.

NORTHERN ONTARIO

Railway Survey to South Lorrain. — The T. & N. O. Ry. Commission has decided to have surveys made of the ground between Cobalt and South Lorrain, with the idea that the Nipissing Central Railway might possibly be extended to that camp. The distance is approximately twenty miles, and it is understood that there are two routes available. While the immediate construction of the line is not contemplated, the commission desires to have the required information in case developments justify its construction.

Kirkland. — The N. O. L. & P. Co. has started the construction of a second power line to the Kirkland Lake district, which will double the amount of power that can be transmitted. The present line has a capacity of 5,000 h.p., and while only 3,800 h.p. is being used, the development of the camp is such that this capacity will probably be taxed in the near future. . The Lake Shore expects to have its 300-ton mill in operation this fall, and the Wright-Hargreaves will probably double the capacity of its mill next year. There is also the probability that the mill of the Tough-Oakes may be started within the next two or three months, and with the work proposed and that now under way, the demand for electric energy will be heavy. Operators in Kirkland have had many complaints to make regarding the quality of the service rendered, claiming that the interruptions were too frequent . The second power line will go a long way toward rectifying this condition. The Power Company is also installing new turbines at its Matabitchoun plant, which will add considerably to its capacity.

Developments on the 10th level of the Teck-Hughes Mine are understood not to be so satisfactory as anticipated. No.1 vein, where cut on this level, while showing satisfactory widths and values, is not as high in grade as it was above, while No. 3 vein, where encountered, showed only low values. It is probable, however, that this is a lean section in the vein, and better ore may be found with a comparatively small amount of drifting. The company has installed a gasoline engine of 125 h.p. in order to insure continuous agitation of the pulp in the mill during the frequent power interruptions that occur. The July output amounted to $80,500. This is somewhat lower than the preceding month, but the mill was closed down for a short time, due to the damage to the ball mill.

On the Sylvanite property, which is owned by interests connected with the Wright-Hargreaves, the main shaft has reached a depth of 725 feet, and will be continued to 850 feet or 1,000 feet. When the shaft is completed, two new levels will be opened up On the 500-foot level approximately 1,500 feet of work has been done, and one ore-shoot about 200 feet long, carrying satisfactory values, has been found.

On the Wright-Hargreaves property adjoining, the underground developments continue satisfactory, and a new ore-body has been found on the 400-foot level The shaft has been completed to 1,000 feet, and a considerable amount of development will be done at this depth. The new rolls for the mill, which will increase the grinding capacity to about 700 tons a day, are to be installed shortly, but it is believed that the main additions to the mill, which will result in doubling its capacity, will be put off until next year.

The Continental is getting its new mining plant installed, and expects to start shaft-sinking shortly. A shaft has been sunk to a depth of about 100 feet by hand, and this will be continued to the 700-foot level. It is the intention to sink another shaft of approximately the same depth on another part of the property.

Gowganda. — The new levels on the Castle Trethewey property, in Gowganda, are showing a satisfactory grade of ore, and the company now has a considerable tonnage of high-grade milling rock developed. It is probable that a small mill will be constructed before long, as this is the only way in which the property can

be worked to advantage. Ore reserves are estimated to be approximately 1,000,000 ounces.

Porcupine. — John Taylor & Sons, of London, have dropped their option on the Scottish-Ontario property in Porcupine. Several diamond-drill holes were put down, but results were not encouraging. It is also understood that on the Imerson property, in Larder Lake, diamond-drilling by the same company did not succeed in picking up the extension of the Crown Reserve vein.

Mining Dividend Record. — During the current year the Northern Ontario gold and silver mines distributed approximately $6,000,000 in dividends, and with the distributions that are to be expected, this total will probably be swelled to $8,500,000 by the end of the year. This will be the largest amount distributed by Northern Ontario mines for the past ten years, but will probably be exceeded in 1924, as the Dome is now paying a larger dividend, and is likely the McIntyre will increase its dividend rate. A new dividend payer is the Keeley Silver Mines, which has already made one distribution this year, and has just declared another of 8 per cent. The total dividends paid by Northern Ontario mines is approximately $130,000,000, of which Cobalt has contributed $96,000,000, Porcupine $32,000,000 and Kirkland Lake $1,500,000.

Unifair Criticism of Mines. — The *Toronto Telegram* has been writing a series of articles on the mining industry of Northern Ontario. The mining interests of this country are always glad to see publicity given to the mines, and while they do not always expect a boost, they do not look for unfair criticism. Some of the statements made by the *Telegram* have not been fair to the individual mines. This probably arises from a lack of knowledge, rather than from a desire to be critical; but it is unfortunate that with a paper like the Toronto *Telegram*, the articles should not be written by a man who has some knowledge of the industry.

NOVA SCOTIA

Injunction Proceedings. — No decision has been reached as yet in the courts at Halifax in the proceedings between the deposed U. M. .W A. officials of District 26 and the provisional executive. It is doubtful whether the injunction taken out by the latter has a legal status, as the U. M. W. A. is not incorporated and has no standing in the eyes of the law. It now appears that the provisional executive blundered when they applied for this injunction, as it is likely to show up their lack of legal status. The fact that the locals have voted in favour of President Lewis' order to return to work is sufficient to show that the provisional executive are in a strong position, irrespective of any injunction proceedings.

Reorganization. — There are fourteen National Officers of the U. M. W. A. in Nova Scotia from Indianapolis, all men of wide experience. Some of them have been employed in re-organizing the union in the strike-ridden state of Kansas, where the notorious Alexander Howatt has been even more successful in keeping that district in a state of turmoil than has J. B. McLachlan in Nova Scotia.

There seems to be no clear idea in the minds either of the public or of the miners as to how the deposed district officers are to be kept out of the U. M. W. A. Locals. This was done in Kansas, and it will be done in Nova Scotia, so that their "bore-from-within" tactics will be prevented in future. The National Officers will remain until this point is settled satisfactorily.

When a U. M. W. .A. reorganization took place in Alberta it was two years before permanent officers were elected. Meantime a new organization was formed and many miners belonged to both. It is not yet certain what the event will be in Nova Scotia.

Record Production Last Week. — In the meantime the coal output is climbing and in less than two weeks after the men returned to work a record output was made. It now appears that all are determined to do their best to try to make up for lost time. There are yet four months of the season before navigation closes and much may be done to overcome the loss occasioned by the strike. With no interruption from boys' strikes (and this is assured by the National Officers, who have notified the locals and the Coal Company that they will summarily deal with these cases, should they arise), the year 1923 may have a largely increased output.

Labor in the mine may, from this out, be better balanced and men may be placed in positions to give the best results from their work, which will be more satisfactory. In the past much opposition has been experienced by the Company on the part of the younger men, who refused to go to the faces to mine coal. The removal of this opposition will greatly assist the community and the coal companies. For years the wages of the classes of labor in which these youths were employed were so high that there was no incentive to strive to enter the skilled classes of mining. Every attempt made by the company was opposed, even to the point of striking. This was most discouraging to the coal companies, who were forced to import skilled labor. It also worked hardship to the miners who had families of boys growing up, because there was no chance of getting their own boys to work until the boy classes moved upwards.

It is now hoped that the number of miners at the working face will be largely increased and the number of detal men decreased. In the United States the ratio of miners to datal men is about two to one. In Nova Scotia this is reversed and the datal men now dominate. This is a large unproductive load to carry and until it is lifted and lightened the coal industry of Nova Scotia will stagger along at a slow pace. It should not be difficult to get the national officers, who have experience in the coal fields of the United States to understand the case, and to see the position in which the coal trade of Nova Scotia is placed. The miners themselves are principally to blame for the anomalous situation, and are suffering from it. When it is rectified Nova Scotia coal mining will assume more nearly the importance warranted by its geographical position and its seams of coal.

Quiet and Efficient Work — Not since the days of the Provincial Workmen's Association has there been such peace, quiet and contentment at the collieries as at present. This is directly due to the recent strict enforcement of the law. The mine officials notice that, as a result, discipline has been restored, orders are obeyed and large coal outputs follow as a result. This rapid increase in outputs has given the public much food for thought. Mutual understanding and joint effort will benefit both mine workers and company, and the false teachings of socialist or communist leaders

will soon be showed up completely. It may be some time, however, before the record of 20,000 tons a day is reached. This will require the opening of new collieries now being made ready.

Indianapolis Officials at Work — The fourteen International officers from Indianapolis have done a fine bit of work. It was a pleasure to see the expert way in which they presented the case of workmen whom the Company had refused to re-employ. They appealed to the management on the grounds that these men were misguided, and that generous treatment would win over to the Company many who still were disaffected. They pleaded the cause of these men very effectively, and they have been re-instated wherever work for them was available.

T. J. Brown at Work — During the colliery strike, T. J. Brown, Deputy Minister of Mines, has kept close watch over conditions in the mines. Though he has a corps of inspectors at work continuously, he inspected each colliery personally, and has made a complete record of conditions at various critical periods. It is thorough work like this that gives the mine operators confidence in the provincial Department of Mines.

Industrial Council for Steel Works — The smoke of battle has cleared away and the opposing forces have met and smoked the pipe of peace on the Sydney Steel Works. The workmen have agreed to run the plant on the co-operative plan proposed by Manager Bischoff, and rejected, some months ago. In future all business affecting the employees and all grievances, real or imaginary, are to be threshed out by a joint committee of workmen and officials. The representatives of the workmen will be selected by secret ballot. There will be one representative to each one hundred men or less, except where the men in the department are too few, when several departments will be grouped and represented by one person. There are about three thousand men employed, and the workmen will have thirty-eight representatives on the general works committee. This committee will appoint five or seven from its own number to meet and act with a like committee of the management in handling all contentious questions. Any workman having a grievance must first take it up with his foreman, and afterwards his superintendent. Failing to get redress, he can then place it in the hands of the department representative, who will have it discussed by the central committee and settled. A case once settled cannot be re-opened except by a seventy-five percent vote of the general works committee. The movement for joint coöperation was brought about by the workmen themselves, who having grown tired of paid agitators, decided that the progress of the steel industry in which they are employed depended upon the united efforts of the employers and employees. It took a long time and caused a considerable loss to the steel workers to arrive at this conclusion, but having once made up their minds and decided that quarreling is poor business they went right ahead, and Sydney may now see better days.

Steel Plant Busy — All departments of the Sydney Steel Works are now in operation. Owing to the cancelling of orders due to the strike the prospects are not as bright as could be desired. The rail mill has only part of a small order to fill, and if new orders are not obtained they cannot long continue to operate. The blooming and billet mill, the rod, nail and wire mills are all busy at present, and it is hoped they may continue so for some time; but those who seem to know the conditions of the steel trade are not over-optimistic. However, the getting together of the men and the company may bring about a condition that and the company may bring about a condition that will enable the company to reach out for a larger share of the steel trade.

ALBERTA

Coal Shipments to Ontario. — That the Canadian National Railway has agreed to accept for shipment to Ontario 4,000 tons of Alberta coal at the rate of $7 per ton net is the latest development in the effort being made by the coal operators of the Province of Alberta, backed by the Provincial Government, to secure a foothold in the market of Eastern Canada for Western Canadian coal. It is made clear by the railway officials that this is not a permanent rate but is merely a concession granted with a view to demonstrating to the consumers of the Province of Ontario the quality of the coal of Alberta. This rate holds good until August 31st, applies only to coal shipped by and consigned to the Alberta Government, and covers a total of not more than 4,000 tons. The collieries of the Province have been given shares of this tonnage to fill and all assert that they could take care of much more at a profit. Howard Stutchbury, trade commissioner for the Province, has left for Ontario to receive and to arrange for the distribution of the coal. The hope in Alberta is that the test will be so successful as to prove the soundness of their contention that, given a reasonable freight rate, they can compete successfully in Ontario with the imported American coals and thus remove for all time the distressing problem of the fuel supply of that section of Canada, a problem that intermittently becomes aggravated through a shortage in the United States and the consequent threatened closing off of that single source of supply.

Not all are so optimistic as this, however, as is shown by the remarks of Prof. E. S. Moore, professor of economic geology, University of Toronto, and director of the Royal Ontario Museum of Geology, who is in British Columbia collecting specimens for the latter institution and who has given the press an interview on this subject. He is quoted as saying that it is only a matter of time before many Ontario industries will be compelled to move their plants either East or West in order to be close to adequate coal supplies. The movement, he thinks, would have commenced before this but for the fact that Ontario, with her comparatively dense population, is a large consumer of manufactured mercandise. Increased population in the West, and the consequent increased demand for industrial fuel both in Canada and the United States, he argues, certainly will lead to the decentralization of industry in favor of the West, where fuel is plentiful.

Prof. Moore states that manufacturers and geologists have been interested in the fuel situation in Ontario for years, that the search for coal has cost much time and money, and that in his opinion there is not in that part of Canada any commercial coal whatever. "There are peat bogs", he points out, "capable of considerable development for domestic fuel and there are lignite deposits on the east side of James Bay with an estimated total of 25,000,000 tons; but neither of these are of much help to industry." Around Port Arthur and in the Sudbury region anthracite substances had been found, but they do not occur in seams or deposits but in veins in a badly broken geo-

logical formation. Tests have proved that they are of little or no use industrially, and some ill-founded hopes have been disappointed.

A permanent cure could not be found by the shipment of Alberta coal to the East, in the opinion of Prof. Moore, for, although such shipments might be of value in emergencies, they could not, owing to high cost of transportation, meet the ordinary, every-day requirements.

New Seams of Semi-Anthracite. — A party of prospectors are reported to have returned to Edmonton, after prospecting the Smoky River coal basin and locating a large area of coal-bearing land . They inspected the area covered by what are known as the Hoppe Leases, which are protected by the Government reserve, and found, it is stated, that the coal formation extends far beyond this reserve. They located coal seams on sections that had not been taken up or reserved. The Hoppe Leases, it will be recalled, were the subject of discussion both in the Canadian House of Commons and the Senate recently. Samples of the coal brought back for analysis show it to be a high-grade semi-anthracite. Three of the seams located by the party are estimated to contain 500 million tons. A railway to the field is projected and survey parties are reported to have been put on the work of reconnaissance.

Strike Threatened — Trouble is threatened in the Edmonton coal district, where the operators have entered into a year's contract with what is known as the District Miners' Federation and the U. M. W. of A. has given notice of a strike. All miners working in the mines on and after the latter date "will no longer be eligible for membership in the U. M. W. of A."

Coal for Ontario.—Premier Ferguson, of Ontario, is reported to be working for a lower freight rate on coal shipped from the Province of Alberta to Ontario. He proposes presenting certain facts and figures to Sir Henry Thornton, President of the Canadian National Railways, which he hopes will result in the fixing of a lower rate than that of $7 a ton, which has been extended to cover trial shipments aggregating 4,000 tons. Ontario's Premier is convinced that tonnage enough could be guaranteed to justify a rate that would permit Alberta's product to compete with Pennsylvania coal.

BRITISH COLUMBIA

Stewart — A controlling interest in the Hercules Mines Ltd., is reported to have been secured by eastern financiers who have arranged for a vigorous continuance of development. The Hercules claims adjoin the "Big Missouri" on the north and are in the centre of the explored mineralized zone of the Portland Canal District. The late General R. G. Edwards Leckie was the president of the Company as well as the managing engineer, but nothing has been done on the property since 1920. Extensive showings of quartz and sulphides were exposed in 1911. The indicated values in gold and silver were encouraging, but a 200-foot tunnel driven in 1920 failed to strike the ore and a shaft sunk on a vein for some 30 feet encountered a fault. It is understood that R. L. Clothier will have charge of the work now planned.

An attractive body of chalcopyrite is reported to have been opened up on the "Morning Star" Group near the head of the north fork of Glacier Creek, Salmon River District. This is close to both the "Sunshine" and the "Ruth & Francis" Groups, which are under bond to the Granby Company and C. A. Mackenzie respectively.

Louis Watkins, of Stewart, made application recently in the Supreme Court of British Columbia for an extension of time in which to survey nine mineral claims adjoining the property of the Premier Gold Mining Co., Portland Canal District. In the course of the argument Mr. Justice Gregory is reported to have observed, "this looks to me like claim jumping." A Supreme Court action is pending between Watkins and the Premier Extension Gold Mining Co., the latter having been incorporated last January with an authorized capital of four million dollars. Watkins, in his attempt to establish title to the Company's claims, is attacking the staking, asserting that the Company and its predecessors have not complied with the terms of the Mineral Act which require the finding of mineral in place before staking, and it is alleged that stakes were planted in the snow and not in the ground.

Prince Rupert — Dr. G. A. Young, of the Canadian Geological Survey, called at Prince Rupert recently after spending some weeks examining the iron ore deposits of the Queen Charlotte Islands on behalf of the British Columbia and Dominion Departments of Mines. On completion of his work in this section he will turn his attention to some of the magnetite deposits of Vancouver Island.

Smithers — The Duthie Mine on Hudson Bay Mountain near the town of Smithers, has been acquired by the Federal Mining & Smelting Co., a subsidiary of the American Smelting & Refining Co. This property has been known as the Henderson Group and for years was the subject of intermittent development without decided results. Within the last year or two J. F. Duthie, of Seattle, became interested and under his direction the work of opening it up proceeded actively. During recent months several cars of ore have been shipped to the Trail smelter from which most encouraging returns were received. This success has occasioned marked mining activity in the district. Several other properties in the vicinity are being developed and a new impetus has been given to prospecting. The Duthie Mine is practically on the line of the Grand Trunk Pacific Ry. It is some 100 miles east of Prince Rupert and some 350 miles southeast of the Premier Mine and is likewise on the eastern side of the Coast Batholith.

H. A. Guess, vice-president and managing director of mines for the American Smelting & Refining Co., who has been visiting British Columbia, authorized the foregoing statement at Prince Rupert. He had just returned from an inspection of the Dome Mountain Property recently taken over by his Company. This also is in the vicinity of Smithers.

It is stated also on the authority of Mr. Guess that these properties will be developed vigorously, that ore will be shipped to the Selby Smelter, California, being transported by team and tractor from the mine to the railway at Smithers, and that Charles Wethered, formerly of Wallace, Idaho, will be in charge.

It is stated that Mr. Duthie will receive $250,000 for his properties, in which he retains a substantial interest.

The Copper Rod Bounty — J. G. Parmelee, O.B.E., assistant deputy minister of Trade and Commerce, Ottawa, is in British Columbia obtaining information upon which to base regulations governing the applica-

tion of the bounty on copper bars and rods which was provided for at the last Session of the Dominion Parliament. This authorizes the payment of 1½ cents a pound on Canadian-made copper bars or rods until June 1924. After that the bounty is 1¼ cents a pound and is reduced each year until June, 1927, when it becomes ½ cent. In June 1928 it expires. At present the only company in a position to take advantage of the bounty is the Consolidated Mining and Smelting Co. whose plant is at Trail.

Greenwood — The uncovering of a new lead of high-grade ore in the Combination Mine of the Eholt Mining Co. has put new life into the mining town of Greenwood. The discovery was made some 230 feet from the portal and good values in grey copper and silver are reported to be established. Drills are to be put to work immediately to further prove the ore-body and a shipment to the Trail Smelter is planned as soon as the ore can be assembled. The Combination is one of the oldest mines of the Greenwood District, having been located in April, 1892.

Old Granby Smelter Being Removed — The Hecla Mining Co., has taken over the old smelter plant of the Granby Consolidated Mining and Smelting Co., at Grand Forks, and the work of dismantling has commenced. The material is to be shipped to Burke, Idaho, for use in the construction of a new concentrating plant.

Fluorite Shipment—Shipment of about 2,500 tons of "reject fluorspar" of the Rock Candy mine, Lynch Creek, to the Trail Smelter will be started shortly. Because of the American tariff against fluorite concentrate, it is not expected that the Rock Candy mine will resume operations, as its product was marketed to a large extent in the United States.

Usk. — John Willman, manager of the Kleanza Company, states that the opening up of the Valhalla Group situated on Kleanza Mountain near the town of Usk, northern British Columbia, has disclosed three veins, on one of which a tunnel was driven 35 feet last year, the sampling of which gave returns between $7.50 and $87 a ton in value. This year they have been drifting on the same vein 1,800 feet lower down. This now is in about 27 feet and, although no assays have been secured, free gold is said to have been disclosed from the portal to the face.

The Trona Mineral Group, composed of three claims on Kleanza Creek, a branch of the Skeena River, also is showing up well with development.

Smithers. — The Provincial Government is extending substantial aid in the construction of roads to assist in the opening up of the Duthie properties near Smithers. The exceptional results obtained from shipments made to Trail from this section have led to much mining activity in the district. The Cascade Group is the latest prospect to attract attention. High-grade ore is reported to have been struck here and a number of mining engineers have visited the property on behalf of eastern mining interests.

Rock Creek. — Frederic Keffer, consulting engineer, and Andrew Jackson, secretary of the Jack Paul Mining Co., of Spokane Wn., recently inspected the Company's property, the Riverside Mine, near Rock Creek, Boundary District, and are reported to be well satisfied with the results of development. They are confident that their operations will lead to the blocking out of a large body of silver-gold-lead ore. The showings already are good and the promotors believe that the Riverside is destined to become an important producer.

Granby Operations. — H. S. Munroe, general manager of the Granby Consolidated Mining & Smelting Co., has announced that the Copper Mountain mine and the Allenby concentrator will be in operation and on a productive basis sometime between September 15 and October 1. The railway spur from Allenby to the mine is being cleared of several heavy landslides and other repairs effected along the line, at the mine and at the mill. There is plenty of ore broken at the mine to keep the railway and the mill at work for the present. Before this is exhausted newly mined ore will be delivered and the permanence of the industry would appear to be assured so long as the market holds. Regarding conditions at Anyox, Mr. Munroe stated that the repairs necessitated by the destruction of the powder magazine by fire, and the damage it caused to other parts of the plant, already were well under way and that the mine and plant at this point were working at full blast.

Final payment on the Wellington mine, Retallack, was authorized recently at a meeting of the Slocan Consolidated Silver Mines Ltd. held at Nelson. Approximately $20,000 has been spent on the purchase and the development of the Wellington since its acquirement by the present holders, practically all this amount being contributed by the directors and officers of the Company. George H. Wiegand, manager, has recommended more development, and a further amount is to be subscribed to carry out this work. It is intended to complete a raise from the main tunnel level to make connection with the old upper workings, to stope out a fine body of clean galena ore opened last spring by a crosscut and drift on the 200-foot level, to explore two stringers recently found in the main tunnel level containing high-grade ore, and to sink winzes on two ore-shoots.

Kaslo. — Col. Henry H. Armstead, mining engineer, has taken up his residence at Kaslo. He is actively interested in several mining properties in that locality. He states that his intention is to make a thorough survey of the Utica mine to determine what course to pursue in its further development.

Telkwa. — A coal seam on Goat Creek, a branch of the Telkwa River, northern British Columbia, is being developed by Messrs Gillespie & Wilson, who plan to have their mine and plant in shape to supply the Prince Rupert and adjacent markets next winter. .

New Colliery Projected. — Diamond drilling continues on the coal lands of the White Lake Coal Land near Penticton, which is within what is broadly termed the Nicola-Princeton field. Fourteen seams are reported to have been found, the largest with a width 20 feet, others running 14, 11, and 9 feet, as w several 3 feet.. The coal is said to be especially goo for steaming purposes and as a blacksmith coal to be as good as that of Pensylvania or Maryland. The Kettle Valley Railway has agreed to take the coal as soon as production starts

July Coal Production — Figures just issued show the coal production of British Columbia for the month of July to be better than for June by about 26,649 tons the total being 212,809 tons. This is due chiefly to the

whose output has advanced from 22,254 to 45,905 tons, an increase of 23,651 tons, or more than double. The explanation is better demand and, as the market for this coal, particularly at this time of the year, is industry, in the form of railways, smelters, etc., the improvement is both significant and gratifying.

In the main the other active collieries of the Province have about held their own. On Vancouver Island the Canadian Collieries (D) Ltd., with 52,531 tons, mined 4,442 tons more in July than in June; but the Western Fuel Corporation, with 51,334 tons, dropped some 846 tons. The Granby Collieries, Cassidy, also had a shorter output by some 912 tons, their total being 18,-714 tons; while Messrs. King and Foster, operating the new mine in the vicinity of Nanaimo, show an advance of about 100 tons. In the Nicola-Princeton field the Coalmont Collieries, with 10,204 tons, produced in July 595 tons more than in the previous month, while the Middlesboro Collieries and the Princeton Colliery dropped slightly, producing 5,737 tons and 780 tons respectively.

The Late Mr. Savage — J. M. Savage, General Manager of the Canadian Collieries (D) Ltd., died on August 12th last while on an automobile tour of British Columbia and Washington State. According to telegraphic advices he collapsed near Wilson Creek, some twenty-five miles out of Spokane. The news is a shock to all engaged in the coal mining business in the Northwest, among whom Mr. Savage was well-known and highly respected. He has been prominently associated with the business life of the Canadian West for many years. Coming to this Province from Winnipeg about the year 1907, he and John Arbuthnot became associated in the organization of the Red Fir Lumber Co. of Nanaimo. A year or so later they launched the South Wellington Coal Mines which later became the Pacific Coast Coal Mines. From this enterprise Mr. Savage withdrew about the time of the initiation of litigation in which the affairs of that concern have since been involved. It was about the year 1916 that Mr. Savage became General Manager of the Canadian Collieries (D) Ltd. While he was in charge, the finances of that Company were completely re-organized. Since then the Company has been following a progressive policy, the exploration, prospecting, and development of its extensive coal lines on Vancouver Island proceeding hand in hand with economic production.

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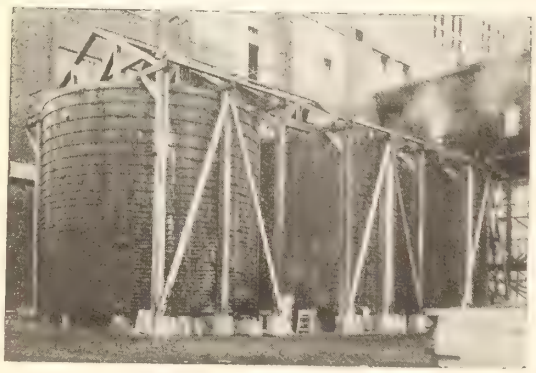
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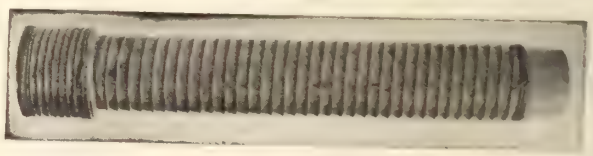
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Aggregate Value of $734,259,619

The substantial progress of the Mining Industry of this Province is strikingly exhibited in the following figures, which show the value of production for successive five-year periods: For all years to 1895, inclusive $94,547,241; for five years, 1896-1900, $57,605,967; for five years, 1901-1905, $96,509,968; for five years, 1906-1910, $125,534,474; for five years, 1911-1915, $142,072,603; for 5 years 1915-1920, $189,922,725; 1921, $28,066,641; for the year 1922, $35,158,843.

Production During last ten years, $339,280,940

Lode-mining has only been in progress for about twenty-five years, and not 20 per cent. of the Province has been even prospected; 300,000 square miles of unexplored mineral bearing land are open for prospecting.

The Mining Laws of this Province are more liberal and the fees lower than those of any other Province in the Dominion, or any Colony in the British Empire.

Mineral locations are granted to discoverers for nominal fees.

Absolute Titles are obtained by developing such properties, the security of which is guaranteed by Crown Grants.

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MINES BRANCH

Department of Colonization, Mines and Fisheries

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MINISTER OF COLONIZATION, MINES AND FISHERIES, QUEBEC

MINER'S CERTIFICATES. First of all, obtain a miner's certificate, from the Department in Quebec or from the nearest agent. The price of this certificate is $10 and is valid until the first of January following. This certificate gives the right to prospect on public lands and on private lands, on which the mineral rights belong to the Crown.

The holder of the certificate may stake mining claims to the extent of 200 acres.

WORKING CONDITIONS. During the first six months following the staking of the claim, work on it must be performed to the extent of at least twenty-five days of eight hours.

SIX MONTHS AFTER STAKING. At the expiration of six months from the date of the staking, the prospector, to retain his rights, must take out a mining license.

MINING LICENSE. The mining license may cover 40 to 200 acres in unsurveyed territory. The price of this license is Fifty Cents an acre per year, and a fee of $10.00 on issue. It is valid for one year and is renewable on the same terms, on producing an affidavit that during the year work has been performed to the extent of at least twenty-five days' labour on each forty acres.

MINING CONCESSION. Notwithstanding the above, a mining concession may be acquired at any time at the rate of $5 an acre for SUPERIOR METALS, and $3 an acre for INFERIOR MINERALS.

The attention of prospectors is especially called to the territory in the North-Western part of the Province of Quebec north of the height of land, where important mineralized belts are known to exist.

PROVINCIAL LABORATORY. Special arrangements have been made with POLYTECHNIC SCHOOL of LAVAL UNIVERSITY, 228 ST. DENIS STREET, Montreal, for the determination, assays and analysis of minerals at very reduced rates for the benefit of miners and prospectors in the Province of Quebec. The well equipped laboratories of this institution and its trained chemists ensure results of undoubted integrity and reliability.

The bureau of Mines at Quebec will give all the information desired in connection with the mines and mineral resources of the Province, on application addressed to

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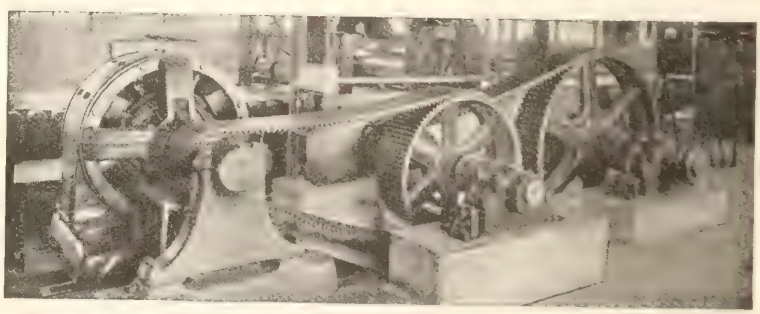

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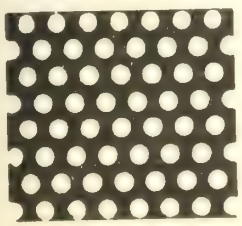

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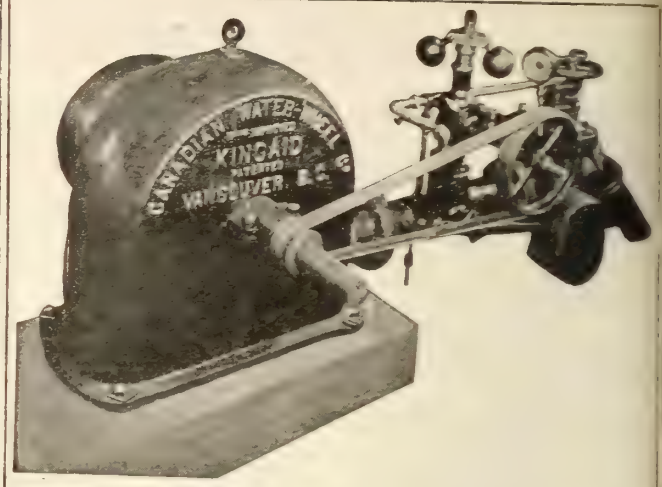

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Holman Bros., Ltd.

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Denver Rock Drill Mfg. Co.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Sullivan Machinery Co.

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Powley & Moody, Limited.

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Mine & Smelter Supply Co.

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Wettlaufer Bros.

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Canada Wire & Cable Co.
Canada Wire & Iron Goods Co.
Dominion Wire Rope Co., Ltd.
Greening, B. Wire Co.

Saline Refiners:
Goldsmith Brothers.

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Ledoux & Co.
Milton Hersey Co.
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Mine & Smelter Supply Co.

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Greening, B. Wire Co.
Hendrick Mfg. Co.
Canada Wire & Iron Goods Co.

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Hendrick Mfg. Co.

Screens — Perforated Metal:
Hendrick Mfg. Co.

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Hendrick Mfg. Co.

Screens — Revolving:
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Hendrick Mfg. Co.
The William Kennedy & Sons, Ltd.

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Canadian Mead-Morrison Co.

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Canadian Steel Foundries, Ltd.

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Hull Iron & Steel Foundries.

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Canadian Brakeshoe Co., Ltd.
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Hadfields, Ltd.
The William Kennedy & Sons, Ltd.
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Sullivan Machinery Co.
Peacock Brothers Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Canadian Mead-Morrison Co.

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Steel Drums:
Smart-Turner Machine Co.

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Hull Iron & Steel Foundries Ltd.
Canadian Steel Foundries, Ltd.

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Denver Rock Drill Mfg. Co.
Sullivan Machinery Co.

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Ontario, Wind Engine & Pump Co.
Pacific Coast Pipe Co., Ltd.
Mine & Smelter Supply Co.

Tanks, Cyanide, Etc.:
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Pacific Coast Pipe Co.

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The William Kennedy & Sons, Ltd.

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Holman Bros., Ltd.
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Canada Wire & Cable Co. Ltd.
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Greening B., Wire Co.

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Standard Underground Cable Co. of Canada, Limited.

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Canada Wire & Iron Goods Co.
Dominion Wire Rope Co., Ltd.
Greening, B. Wire Co.
Northern Electric Co., Ltd.

Wire Rope Fittings:
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Canada Wire & Iron Goods Co.

Wire Cloth:
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Canada Wire & Iron Goods Co.

Wire Chains:
Greening, B. Wire Co.

Zinc:
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Greening B. Wire Co.

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TORONTO ONTARIO

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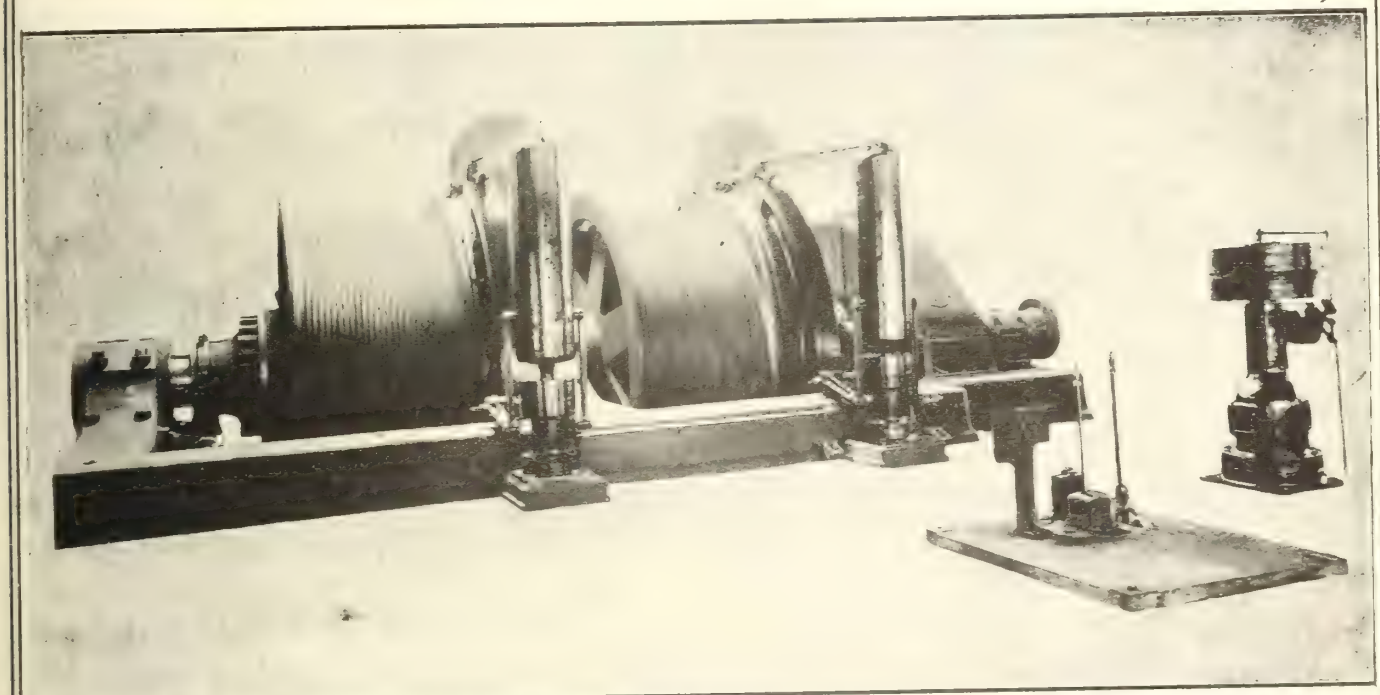
Built in Canada



This Hoist hauls a 15 Ton Load on a 45° Slope at 1600 ft. per minute. Drums 107" Dia. by 50" face. 1¾" Rope. Driven by 900 H.P. Motor Through Single Reduction Herringbone Gears. Clutches and Brakes Oil Operated.

One of several exclusive features of the "OTTUMWA" Hoist is the PROPORTIONAL PRESSURE CONTROL for power operated brakes. Successive positions of the hand levers give definite and increasing increments of braking effect. A simple and reliable device which effectively replaces the usual complicated gear with superior results. Has proved its worth on many installations.

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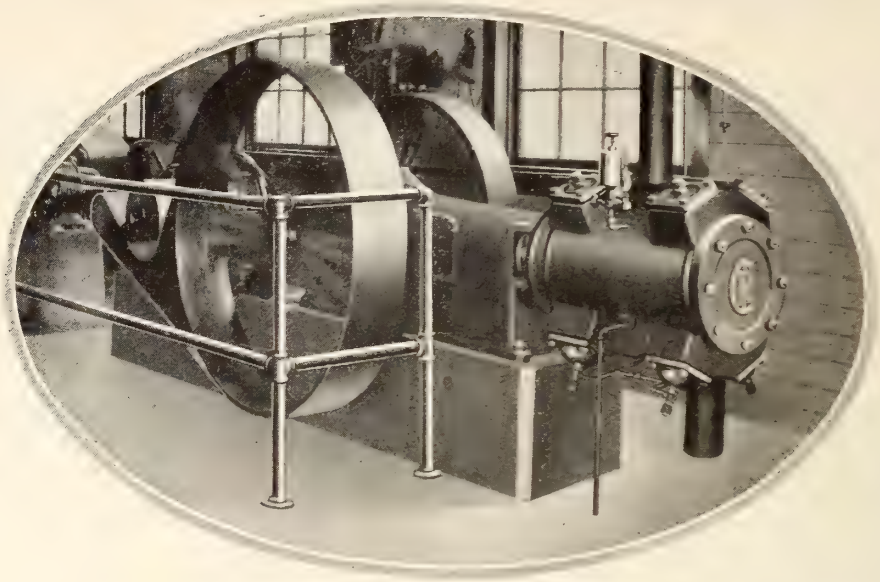

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THE small compressor for furnishing air to three or four rock drills, a small hoist or pump, should be as efficient, reliable and as nearly automatic in action as modern design and skilled workmanship can make it.

Efficient because the lower the cost of compressing air, the greater the saving at the time when funds are most badly needed and hardest to get.

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Automatic because the services of a skilled engineer are seldom available and the operator's time can often be used to better advantage in other ways.

For the small mine or quarry there is no simpler or better combination than an "Ingersoll-Rand" Class ER or FR Compressor and Ingersoll-Rand "Jackhamers" or Convertible Drifters and Sinkers.

Furthermore, you can always satisfy yourself before buying as it is easy to locate nearby installations where the worth of this combination is being constantly proven. Class ER and FR Compressors are straight-line, single-stage, double-acting units fitted with Ingersoll-Rand Plate Valves. They are simple, sturdy, compact in construction, reliable, automatic and economical in operation. Class E R units are furnished for long or short belt drive; Class FR for steam drive.

Write our nearest branch for bulletins and names of users in your locality or outline conditions and we will recommend a complete plant to meet them.

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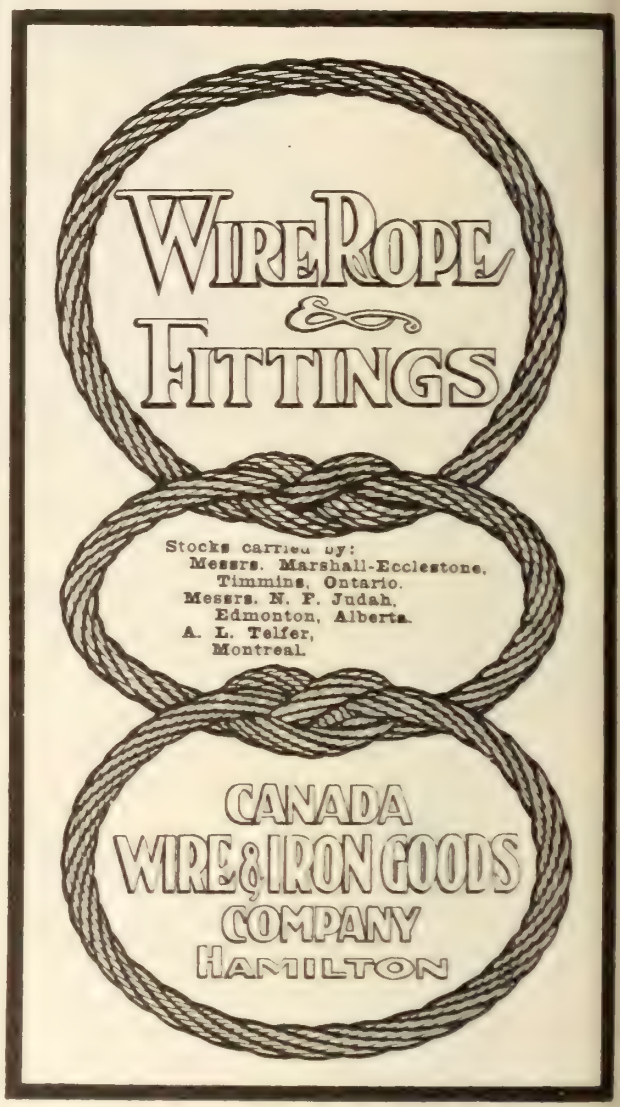
Exhibitors are making elaborate plans to have this year's exhibit surpass any showing made during previous years.

For further information address National Exposition of Chemical Industries, Grand Central Palace, New York



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CANADA
DEPARTMENT OF MINES

HON. CHARLES STEWART, *Minister* **CHARLES CAMSELL,** *Deputy Minister*

MINES BRANCH

Recent Publications

Talc and Soapstone in Canada, by H. S. Spence.

Titanium, by A. H. A. Robinson.

Summary Report of Investigations made by the Mines Branch during the calendar year ending Dec. 31, 1921.

Phosphate in Canada, by H. S. Spence.

The Preparation, Transportation and Combustion of Powdered Coal, by John Blizard.

Road Materials along the St. Lawrence River, from Quebec Boundary to Cardinal, Ont., by R. H. Picher.

Barium and Strontium in Canada, by H. S. Spence.

The Coal-fields and Coal Industry of Eastern Canada, by F. W. Gray.

Analyses of Canadian Fuels. Part I to V, by E. Stansfield, M. Sc., and J. H. H. Nicolls, M. Sc.

Graphite, by H. S. Spence.

Gas Producer Trials with Alberta Coals, by J. Blizard and E. S. Malloch.

The Mines Branch maintains the following laboratories in which investigations are made with a view to assisting in the developing of the general mining industry of Canada:—

Fuel Testing Laboratory.—Testing value of Canadian fuels for steam raising and production of power gas; analyses, and other chemical and physical examinations of solid, liquid and gaseous fuels are also made.

Ore-Dressing Laboratory.—Testing of Canadian ores and minerals, to ascertain most economical methods of treatment.

Chemical Laboratory — Analyzing and assaying of all mineral substances and their manufactured products. Copies of schedules of fees, which are slightly in excess of those charged by private practitioners, may be had on application.

Ceramic Laboratory.—Equipment is such that complete physical tests on clays and shales of the Dominion can be made, to determine their value from an economic standpoint.

Structural Materials Laboratory.—Experimental work on sands, cements and limes is also undertaken.

Applications for reports and particulars relative to having investigations made in the several laboratories should be addressed to The Director, Mines Branch, Department of Mines, Ottawa.

GEOLOGICAL SURVEY

Recent Publications

Memoir 108. The Mackenzie River Basin, by Charles Camsell and Wyatt Malcolm.

Memoir 127. Beauceville map-area, Quebec, by B. R. MacKay.

Memoir 128. Winnipegosis and Upper Whitemouth River areas, Manitoba, Pleistocene and Recent deposits, by W. A. Johnston.

Memoir 129. Geology of the Moncton map area, by W. J. Wright.

Memoir 130. Geology and mineral deposits of the Bridge River map-area, British Columbia, by W. S. McCann.

Memoir 131. Kenogami, Round and Larder Lake areas,

Memoir 132. Geology and ore deposits of Salmon River district, British Columbia, by S. J. Schofield and G. Hanson.

Memoir 133. The southern part of the Sydney coal field, Nova Scotia, by A. O. Hayes and W. A. Bell.

Map 68A. Moncton, New Brunswick. Geology.

Map 155A. Portions of the districts of Algoma, Sudbury and Timiskaming, Ontario. Geology.

Map 1585. Mackenzie River basin, 1922 edition. Geology.

Map 1751. Wainwright, Alberta. Topography.

Map 1752. Monitor, Alberta and Saskatchewan. Topography.

Map 1767. Sydney, Nova Scotia. Geology.

Map 1830. Vermilion; townships 47 to 55, ranges 5 to 10, west of the fourth meridian. Topography.

Map 1831. Vegreville; townships 47 to 55, ranges 11 to 16 west of the 4th meridian, Alberta. Topography.

Map 1860. Keno Hill area, Mayo district, Yukon. Geology.

Map 1948. Wanapitei Lake area, Ont. Geology.

Map 1964. Brockville-Mallorytown area, Leeds county, Ontario. Geology.

Map 1965. Fraser River delta, British Columbia. Geology.

Map 1972. Michipicoten area, Ontario. Geology.

Map 1977. Mackenzie river between Norman and Beaver river, district of Mackenzie. Geology.

Applicants for publications not listed above should mention the precise area concerning which information is desired.

Summary Report — The annual Summary Report of the Geological Survey is now printed in parts. Applicants should, therefore, state what particular geologist's report is required, or what subject they are interested in.

The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon.

Communications should be addressed to The Director, Geological Survey, Ottawa.

Ontario's Minerals

PROVINCE OF ONTARIO

Hon. CHARLES. McCREA, Minister. DEPARTMENT OF MINES *Thos. W. Gibson*

Mineral Areas

Ontario, with its 407,262 square miles, contains many millions of acres in which the geological formations are favourable for the occurrence of minerals 70 per cent of the area being underlain by rocks of pre-Cambrian age. The phenomenally rich silver veins of Cobalt, Gowganda and South Lorrain occur in these rocks; so also do the far-famed nickel copper deposits of Sudbury, the gold of Porcupine and Kirkland Lake, and the iron ore of Magpie and Moose Mountain mines.

Economic Minerals

In addition to the above, practically all economic minerals (coal and tin excepted) are found in Ontario: — actinolite, apatite, arsenic, asbestos, cobalt, corundum, feldspar, fluorspar, graphite, gypsum, iron pyrites, lead, mica, molybdenite, natural gas, palladium, petroleum, platinum, quartz, salt, talc and zinc. This Province has the largest deposits on the continent of talc, feldspar, mica and graphite.

Building materials, such as ornamental marble, limestone, sandstone, granite, trap, sand and gravel, lime, Portland cement, brick and tile, meet every demand.

Mineral Production

Preliminary returns show the output of the mines and metallurgical works of the Province for the year 1922 to be worth $62,202,169, of which the metallic production was $38,190,711.

The following figures show the growth of Ontario's mineral industry by five-year periods since 1891 when a Bureau of Mines was first established.

Year.	Value.	Year.	Value.
1891	$4,705,672	1911	$41,976,797
1896	5,235,003	1916	65,303,822
1901	11,831,086	1918 (Maximum war output)	80,308,972
1906	22,388,383	1921	48,128,387

Dividends.

Dividends and bonuses paid to the end of 1922 amounted to $28,096,699 for gold mining companies, and $86,238,185 for silver mining companies or a total of $114,334,884.

Mining Regulations

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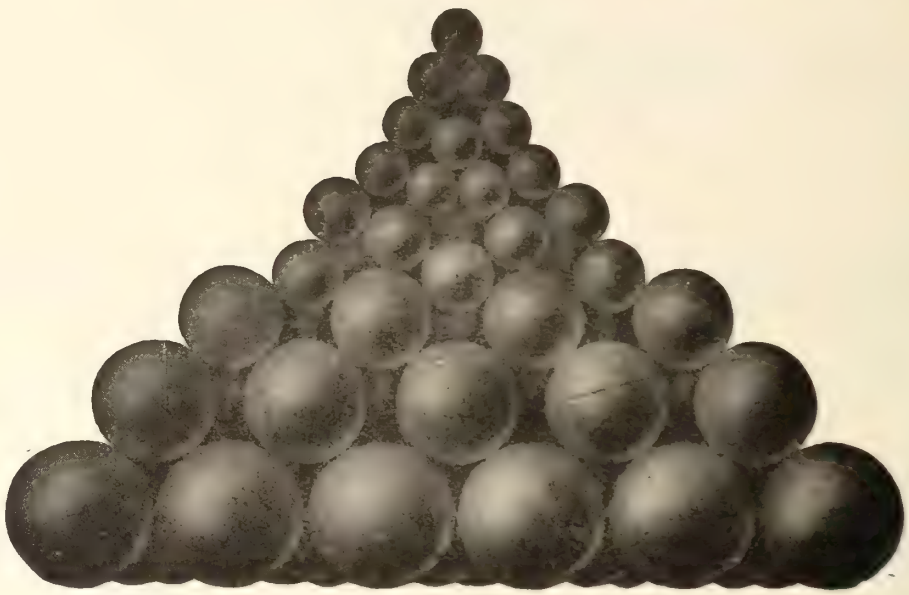

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PUBLISHED WEEKLY

Devoted to the Science and Practice of Mining, Metallurgy and the Allied Industries; and more particularly to their progress in Canada

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:-: EDITORIAL :-:

A JOB FOR THE INSTITUTE

Last week we suggested that the Canadian Institute of Mining and Metallurgy should, for its own sake as well as for the benefit of our mining industry, undertake to apply itself to the solution of problems of national scope and importance. Its success last spring in stimulating active interest from coast to coast in the fuel problem demonstrates its capacity for such work. The effort should be carried on not sporadically but continuously. Today we shall suggest specifically a problem that may warrant the Institute's attention.

On another page Mr. H. G. Nichols discusses the problem of depletion allowance in respect of mine taxation. Taxation affects vitally every operating mine in Canada, and the depletion allowance affects particularly metal mines. Thus, although the taxation is in the hands of the provinces, with the exception of the prairie provinces, whose mineral lands are still administered by the federal government, the question is of national scope and importance. It is highly desirable that the mineral tax regulations of the provinces and the Dominion should be reasonably uniform. It is also most important that no part of the mining industry in any part of the country should be subject to unjust discrimination. The problem would thus appear to fall within the scope of Institute activities.

In those provinces where there is an important mining industry, associations have been formed to represent the mine owners before the public and before the various governing bodies. It is a phase of the activities of the Mining Association of British Columbia that Mr. Nichols discusses in his article. The Alberta colliery owners have been very active recently in a combined attempt to extend their markets. The Ontario Mining Association has become an influential body during its comparatively short existence. The Quebec asbestos operators are suffering sadly from the lack of concerted effort such as is secured through such an association. The mining industry of Nova Scotia is mainly in the hands of one company, and consequently its negotiations with public authorities are a comparatively simple matter. But there is no national representative of the Canadian mining industry except the Institute.

Unless the Institute tackles these problems of national scope, no one will. Of course there is the possibility that a new organization will be formed to study and solve such questions and to see that the solution is put into effect; but we cannot see that any new organization is necessary. Those primarily interested are to be found already, almost to a man, within the Institute's membership. If any remain outside, it is because membership is not sufficiently attractive to them, and constructive effort on an adequate scale is more than likely to provide the missing attraction.

We have made a specific suggestion. It may not be a good one; let someone make a better. But for heaven's sake, let us start something going.

A PROMISING HALF-YEAR

Canada's mineral production for 1923 is likely to approach, if not to surpass, the record year, 1920. This is indicated by the report from Ottawa on the output of the first six months, which is noticed on another page. The half-year's output is valued at over $87,000,000, an increase of 44 per cent. over that for the first half of 1922. This is in spite of curtailment in the production of gold due to the serious power shortage in Ontario. The revival of industry in general throughout the country is the most important factor contributing to this sudden increase. But, more important in the long run, the Dominion's capacity to produce minerals is being expanded steadily, thus aiding to swell the total by a moderate but progressive annual amount.

The most outstanding advance of the year is, of course, in the nickel industry, which has reached its pre-war dimension and promises soon to exceed it. Intensive research and judicious advertising are jointly responsible for this satisfactory condition. With the aid of South Lorrain, the Premier, and the Mayo camp, silver is holding its own. With Anyox going at full blast, the new Britannia mill in operation, Copper Mountain about to join the list of producers and Rossland on the point of operation, the outlook for copper production is bright. Before the year is out the new mill at Kimberley for Sullivan ore will make the figures for lead and zinc climb.

The asbestos district has "come back" wonderfully during the year, thus far, and no diminution of sales is foreshadowed for the second six months. The coal miners of Nova Scotia are making up rapidly for the ground lost during the strike, and there is still hope that the total for the year will be not far short of the record of 7,980,000 tons in 1913. The Alberta collieries, ever seeking an expanded market, have virtually captured the Manitoba trade and are making

a bold bid for part of Ontario's custom. Building has recommenced on a moderate scale, so that the other principal non-metallics are in normal demand.

All told, the half-yearly summary of mineral production is a satisfactory and encouraging statement. But we must remember that the ground gained requires to be consolidated before it is secure in our hands; and no effort should be spared to reduce, by every possible means, the wild, pendulum-like swings that result alternately in hectic activity and stagnation. To eliminate this curse of modern industry is beyond the power of those of the mining fraternity; but the miners can at least do their bit in studying the problem and seeking a solution.

A PADRE IN THE MINES

Canon Scott's decision to visit the collieries and steel works of Cape Breton is worthy of our well known and respected soldier-padre. Military affairs have an irresistible attraction for the Reverend Mr. Scott, and when the active militia of Canada, almost in full force, gathered at Sydney recently, he simply had to join them in some way or the other. Unfortunately for him, the "enemy" was not susceptible to attack in the ordinary way, and the reverend gentleman, to participate at all, had to attack either the labour leaders or the management of the British Empire Steel Corporation. In choosing the latter against whom to aim his shafts, he was, we doubt not, influenced mainly by a feeling for the under dog. From our knowledge of the case we should judge that he did not know at what target he aimed, and certainly he missed the mark. We are satisfied that he has been grossly misinformed. Now he will find out the truth at first hand. If his attack should prove to have been unjustified, or justified only in minor degree, Canon Scott will hesitate not a moment to say so publicly, and in his usual forcible and unequivocal manner. We expect his report will go far toward overtaking the lies that have been spread during recent years by labour agitators in Nova Scotia. If he is able also to indicate any feasible means of improving still further the lot of the workman in Cape Breton, we are confident the Company, as well as the public, will thank him for his pains.

TONNAGE LOST IN COAL MINES

A new item of arresting importance is included for the first time in the report on coal statistics for May, issued by the Dominion Bureau of Statistics last week. This is the table showing the tonnage lost in Canadian coal mines due to absentee-ism, lack of orders, car shortage, mine disability and other causes. Similar information has been given for some time past in the weekly reports from Washington of the United States coal industry. This simple little table gives plenty of food for thought. During May, for instance, Canadian collieries lost 26 per cent. of their output, 15 per cent. of this being due to lack of orders, most of it in the three western provinces. The table will thus show up from month to month the chronic state of over-development in these provinces. During May a flare-up between manager and men at Minto, New Brunswick, brought the percentage lost by absentee-ism up to 12 per cent., the average for the Dominion being only 3 per cent. This information on the negative side of production will be a very useful barometer of events and tendencies in our colliery districts.

NEW DEPARTMENT WILL AID MINERAL DEVELOPMENT

Our railways require the aid of mineral development to make them pay and to keep them prosperous. Mr. W. D. Robb, Vice-President of the Canadian National Railways, made an anouncement last week bearing on this question. He pointed out that the National system has a newly organized "Department of Colonization and Development" at its headquarters in Montreal. It is an enlargement of the former "Industrial and Resources Department", formerly in Toronto in charge of Mr. C. Price-Green, who is at the head of the new department. The stated purpose of the department is to gather from all available sources information concerning the natural resources of the areas served by the railway with a view to passing it on to prospective settlers, prospectors and other pioneers of rural and industrial enterprise. The department will also give active aid to those interested in the natural resources through the numerous channels open to the railway man.

The chief sources of information concerning the Dominion's mineral resources are the various government departments. Besides published reports, these departments have a vast collection of useful data and ideas, on file and available to those who will enquire. The new branch of the Canadian National Railways aims to keep in close touch with these bureaus, both federal and provincial, and has taken practical steps to that end.

To supplement the data available from public departments, the Department of Colonization and Development of the railway has organized its own sources of information. From the officers and employees in the various central offices and scattered up and down the 22,000 miles of line much that is useful in stimulating development can be learned by the judicious enquirer. To collect and use these facts and ideas is now the specific duty of the new department.

Original and deliberate investigation at first hand can never comprise any large part of the duties of a department such as this; yet it may be a very important part, particularly in the case of the mineral industry. An unusually large fraction of the Canadian National lines will always depend primarily upon the mineral industry for local traffic sufficient to

make them pay. Apart from the four hundred miles where it traverses the Great Clay Belt, the Transcontinental from Quebec to Winnipeg will depend mainly upon the products of forest and mine for its freights. The same can be said of the former Canadian Northern main line from Sudbury to Winnipeg. In the West the growth of a large industrial community round the colliery districts will transform the balance sheets of all the sections of railway within their reach. The present mining activities in the vicinity of Smithers, British Columbia, promise to bring prosperity to that section,—an untravelled wilderness until the Grand Trunk Pacific was pushed through to Prince Rupert. The Pacific Great Eastern is typical of a host of small lines and branch lines from Atlantic to Pacific, now a burden on the public purse, and awaiting the efforts of the miner, lumberman or paper maker to provide them with an income. Officers of the new department are now at work investigating some of these prospective mineral fields at first hand.

One of the most important adjuncts to the development of a new mineral area is, of course, railway transportation. The Canadian National organization is now equipped, through its new department, to investigate promptly prospective mining camps with a view to constructing branch lines.

The Department of Colonization and Development has a task of prime importance to perform on behalf of the Canadian public. We are confident that, with sound direction and energetic performance, it will add much to the income of the Canadian National Railways.

BUBBLES IN IDAHO AND LABRADOR

The platinum fakirs in the Western States are having a thin time. A few weeks ago the United States Bureau of Mines exposed their fraudulent claims in a most conclusive manner. Now the Bureau of Mines and Geology of Idaho, connected with the State University, shows that without exception the supposed platinum mines of that state do not contain even a trace of the precious metal. In addition, samples from the promoters actually containing platinum have been shown by microscopic examination to contain it in the form of platinum foil. The names of the promoters from whom these salted samples were obtained, as well as of others connected with the illicit venture, are given plainly and the method of their deception described.

An accusation made against the public authorities by these swindlers—the same we have heard in Canada recently in conection with the alleged coal beds near Sudbury — is that they were leagued together against a company of honest miners. With this point in view, the Idaho Bureau of Mines submitted a full set of samples taken from the supposed platinum deposits not only to the highest authorities on such analysis in the United States, but to the Provincial Mineralogist of British Columbia and the Consolidated Mining and Smelting Co. at Trail. The assay returns from these foreign authorities agreed in every detail with those made in the United States.

Once more we point out that this plain and unequivocal statement by public authorities of their knowledge of a fraud is a most potent means of preventing its recurrence. There are plenty of similar frauds being perpetrated in Canada today. Cannot our public authorities expose them likewise? The Labrador bubble has burst. Might not a simple statement from Ottawa or from Quebec have pricked the bubble before it was swelled from the pockets of scores of victims?

HELIUM

The technical session in Montreal that terminates the ten-day tour of the American Institute of Mining and Metallurgical Engineers through the mining districts of Ontario and Quebec has much of an international character, both as to its personal and its programme. At the geology session there is a paper whose title might lead one to believe it is abstruse, but whose import is wholly practical. This is Dr. Richard B. Moore's discussion of helium.

It is less than thirty years since Sir William Ramsay first determined that the gas emanating from certain minerals containing uranium and thorium is the same as the gas that, with hydrogen, composes the outer reaches of the sun's incandescent atmosphere. Though so abundant in the sun, it remained a rare element on this earth until the last decade,, when a systematic search revealed its presence in amounts up to two per cent. in the natural gas of various districts of the United States and Canada.

So far as has been determined, helium forms no stable compounds; it is completely inert. It has a density of 1.98 ((hydrogen=1), so that its lifting power is only half that of hydrogen; but still it is only one-seventh as heavy as air. Its boiling point,, which is approximately the point at which it liquifies, is-268° Centigrade, very close to the absolute zero. The fact that the other gases mixed with it in natural gas become liquid at considerably higher temperatures is used for their separation. As the giant dirigibles now in use or under construction contain up to two million cubic feet of gas, one can gauge the vast amount of natural gas that must be treated before one of them can be filled with helium.

Dr. Moore says the United States has virtually a monopoly of the world's helium supply. Only two small sources are known in Canada, one in Ontario and the other in Alberta, containing 0.34 and 0.33 per cent. helium. As yet we know very little about the natural gas resources of Alberta. Their development may quite possibly provide a helium supply for the British Empire.

Canada and the Imperial Economic Conference

By A. R. R. JONES, Editor, "Journal of Commerce."

The Imperial Economic Conference will assemble in a very few weeks, and the Canadian representatives will shortly be leaving this country to attend the same. A great opportunity is offering for the solution of Imperial economic problems in such a way as to increase the prosperity, the unity and the security of the whole British Empire. One trusts — profoundly trusts — that the representatives of all the nations which compose our world-wide Empire will have the understanding and the wisdom to avail themselves to the full of the opportunity which offers now, and which, if lost, may not lightly be recovered.

The present writer has frequently pointed out why it is particularly essential just now that every effort should be made to foster and stimulate inter-Imperial trade, and he has no intention now of covering that ground again. He has never urged that any one part of the Empire should sacrifice its own commercial and industrial interests to those of any other part. Great Britain is a great manufacturing country, and the overseas Dominions — and notably Canada — are developing their own manufacturing industries with speed and success. Yet there is no part of the Empire which can be said to be self-supporting in the matter of commodities. Each is under the necessity of importing products from outside its borders. Such products, with very few exceptions, are obtainable elsewhere within the Empire.

The objective to be aimed at, then, is for citizens of the Empire to buy Empire-made goods — for Great Britain to buy all she needs, and cannot herself supply, from within the Empire and for every other nation of the Empire to do the same. But the Imperial Economic Conference must give a definite and unequivocal lead — must devise the means for the consummation of this highly desirable end.

So far as Canada is concerned, her position, by reason of her proximity to the United States, is different from the other countries of the Empire in this matter of inter-Imperial trade. More than one-half of Canada's trade is done with the United States, and, next to Great Britain, she is the best customer the United States has. With the Fordney tariff erecting a barrier against Canadian products, it is likely that Canadians in general would welcome Empire-produced goods in preference to those produced in the United States, provided always — and the proviso is a substantial one — that the price and quality are equal.

There is one matter, to which I have adverted before, as to which I trust that our representatives at the Imperial Economic Conference will speak plainly when face to face with the representatives of Great Britain at the Conference table. Here in Canada we are rapidly becoming a manufacturing country of considerable importance. But we need outside help in developing our manufactures. At the present moment, that help is mainly coming from the United States. It is up to the British to change this — to aid in the development of Canadian industry to a far greater extent than they are doing.

A recent estimate places the United States capital invested in Canada at $2,500,000,000, or almost as much as the British investment in the Dominion, and the greater part of this investment (approximately $1,750,000,000) is estimated to have been placed since the pre-war period. Statistics recently made public by the Canadian Pacific Railway indicate that United States investors now hold $701,000,000 of Canadian government, provincial and municipal issues, as against $511,000,000 held by British investors. In other words, United States investors hold 18.5 per cent. of the total amount of the above issues compared with British holdings of 12.8 per cent.

The showing relating to investment in Canadian industrial enterprises is even more striking. United States investment is estimated at $848,455,589, or 31 per cent. of the total investment, and the estimate of British capital in these enterprises is $285,153,175 or 10.3 per cent. of the total.

United States capital has gone into Canadian railways, mines, motor car and accessory industries, meat-packing, rubber, paint, metal, pulp and paper, and refined petroleum industries. The Canadian Pacific Railway estimates that 24.1 per cent. of its shares are owned in the United States as against 47.8 per cent. held by British investors and presents these figures as typical of the direction of outside investment in Canadian railways. It also reckons that United States investors hold 32.36 per cent. of securities of Canadian mines whereas British investors own 15.46 per cent. It is notorious that the Canadian motor car accessory industry has drawn practically all its capital from the United States. The United States also has contributed 80 per cent. of the capital invested in the Canadian pulp and paper industry, 61 per cent. to the motor car industry, and 40 per cent. to such important Dominion enterprises as the meat-packing, rubber, and refined petroleum industries.

Figures such as those we have given should cause leaders of industrial and economic thought and activity in Great Britain seriously to ponder the situation in which Canada finds herself in relation to

Great Britain, on the one hand, and the United States, on the other. We are not among those who believe that Canada's loyalty to the British Empire is so skin-deep that it can be deflected by any trade, on however large a scale, with a foreign country. But, none the less, save in a purely material sense, it is not altogether well for Canada for a foreign country to have almost a predominant stake alike in our public issues of securities and in our private industrial enterprises. Nor, should we imagine, is such a state of affairs altogether well from the standpoint of Great Britain herself. If it is not, the remedy is in the hands of her financial and industrial leaders.

Incidentally, it may be added that not only capital is being contributed by the United States to the development of Canada's wonderful resources. Accustomed to great movements of population from Europe to the United States one is apt to overlook the fact that there is a country into which large numbers of the United States' own citizens find it desirable to emigrate. Total immigration into Canada in the years 1900 to 1922 was 3,667,310 and more than one-third of that number were from the United States. In fact the emigrants from that country numbering 1,395,853 exceeded the number of British emigrants to Canada by more than 30,000. When note is taken of this circumstance, coupled with the important position the United States has assumed in relation to Canadian industry and finance, we imagine that the significance of the conjunction cannot fail to be apprehended in Great Britain.

MINERAL PRODUCTION OF CANADA FOR THE SIX MONTHS ENDING June 30, 1923

A report on the mineral production of Canada for the first six months of 1923 has just been issued by the Dominion Bureau of Statistics. This report shows that the mining industry has recovered almost entirely from the slump of the last few years. The production of the mineral commodities covered amounts to $87,152,248 in value as against $60,361,109 for the same period last year, an increase of 44 per cent. The production of metallic minerals is valued at $39,244,614, while that of the non-metallics amounts to $47,907,634. These show increases of 48 per cent and 41 per cent respectively, the corresponding productions for 1922 being $26,475,544 and $33,885,565.

In the metallic section the outstanding increases were in the production of nickel and copper. The surplus stocks existing at the end of the war seem to have been absorbed, and from now on a steady production is looked for. The increase for the full year promises to be still greater, as one large potential producer did not start operations until well on in June.

The gold mining industry is in a satisfactory condition, although the production shows a slight falling off from that of the corresponding period last year. This was due entirely to the prolonged power shortage in Porcupine this spring, a dry fall followed by a late breakup of ice on the lakes and rivers proving a severe handicap to the power companies. With increased crushing capacities, and one new producer assured, it is expected that the 1923 total will equal that of 1922. The gold production of Canada for the first six months of 1923 amounted to 530,402 fine ounces valued at $10,964,382.

Silver production also showed a slight falling off when compared with that of the same period in 1922. However, the outlook for this industry is particularly bright for the latter part of the year. Large shipments during the summer from the new silver mining districts of the Yukon will undoubtedly make up for any declines in production from the older camps. During the first six months 8,336,946 ounces valued at $5,506,469 were produced contrasted with 8,905,454 ounces valued at $5,997,199 in 1922.

The other metals all showed increases in production compared with the same period last year.

The section dealing with coal contains comparative tables on the more important statistics pertaining to this commodity. The production amounted to 8,722,205 tons valued at $38,188,343 as compared with 6,205,288 tons valued at $26,993,498 for the first six months of 1922. The increase amounts to 2,516,917 tons valued at $11,194,845 or 40.5 per cent in quantity and 41.5 per cent. in value.

Increased production is general throughout the list of non-metallics, the most important increase being in asbestos. To the end of June, 99,042 tons were sold by producers for $3,574,762, as compared with 54,846 tons and $1,894,232 during the same period in 1922.

Copies of the report may be had on application to the Dominion Bureau of Statistics.

SIR ALFRED YARROW'S GIFT FOR RESEARCH

The Council of the Royal Society have of late been giving their attention to the best way of using Sir Alfred Yarrow's gift of £100,000 for the endowment of research, which was announced in February of the present year. On reviewing the situation, it appeared to the Council of the Royal Society that there was a marked deficiency of positions in which a man who had already proved his capacity could continue to regard research as the main occupation of his life. Consequently, at the council meeting of July 5, it was finally decided to use the larger part of the income in the direct endowment of research by men who have already proved that they possess ability of the highest type for independent research. To this end a number of professorships will be founded, of a type similar to the Foulerton Professorships, which were founded by the society in 1922 for research in medicine. The professors will be expected to devote their whole time to scientific research, except that they may give a limited course of instruction in the subjects of their research to advanced students. There is at present a tendency to regard scientific research as a secondary occupation for men whose primary occupation is the teaching of students. The intention of the Royal Society in founding these professorships is to recognize research as a definite profession. — "The Chemical Age".

ALCOHOL AS MOTOR FUEL

The use of alcohol as a motor fuel is gaining ground rapidly in South Africa. It is used there in admixture with ether made from it, the trade name being Natalite. Though it will not give a mileage equal to gasoline, it is much cheaper, — 2s. 3d. against 3s. 6d. at present. In running it is at least the equal of gasoline.

Depletion Allowance in Mine Taxation

Mining Association of British Columbia Studies the Problem

By H. G. NICHOLS

The general understanding of this subject has not been assisted by the loose employment of terms. For instance, a comparison has been made between the words amortization and depletion. The definition of the former is "the extinction of a debt by a sinking fund;" the latter means "the act of emptying out." The problem associated with the matter of depletion allowance is to know what is the fairest way in which to provide for the fact that mines are being emptied out, and it is clear that the principle of amortization might be applied in carrying out any process to this end; but that is a small matter compared with the question of what is the right process to adopt.

Depletion then is an accepted fact; how to make allowance for it is a burning question.

To begin with, the State has vested interests in its mineral deposits, and if there were no risk attaching to their commercial realization it is conceivable that it would proceed to exploit them. However that may be, the fact is there is a risk, and the State is willing that it should be assumed by Capital. Further, it is in the interests of the State that Capital should be encouraged to assume the risk, to the end that the State may participate in the returns. Now the risks vary and cannot be assessed without the expenditure of Capital; therefore as between the State and Capital it becomes a question of encouraging Capital to try its luck. Insofar as participation in the return from its mineral assets is concerned, the only method so far devised is to impose a tax on income, so that looking at the matter broadly the problem becomes one of adjusting mine taxation, in such manner that Capital may have sufficient inducement to face the indeterminable risks and the inevitable disappointments attaching to the exploitation and development of a Mining Industry.

In other words, the State is bound to protect Capital; it does not want to see Capital lost, because it is only Capital that can keep hammering at the risks and making a profit for the State; and if it is exhausted the Mining Industry gets a black eye. Consequently once a fair royalty or tax upon income has been decided upon, applicable to successful operations, it becomes a question of how much that tax should be reduced in order to protect the Capital involved in the perpetuation of the profit. That is where the question of depletion comes in; the mine is being worked out and the whole cycle of risks must be faced again.

Stated thus, the matter does not seem to be so complicated; but the realization of the facts upon which the calculations must rest has come about only as the result of hard experience and much intensive study on the part of those who have assumed the task of finding an equitable arrangement.

Mining Association and Government Confer

During the past year the Mining Association of British Columbia, under the guidance of the Secretary, Mr. H Mortimer Lamb, has been active in inducing the Provincial Government to consider the problem, and to establish a system whereby a due allowance for the wasting nature of mineral assets may be provided for in the matter of taxation.

A conference was held at Victoria in December 1922 between the Hon. Minister of Finance and representatives of the Mining Association, when the Minister invited the co-operation of the Association and of others interested, and suggested the forming of a Committee consisting of Government officials and representatives of the Association. At that time the calculation for depletion allowance was generally supposed to depend upon the valuation of the property, to the end that a unit charge upon the mineral produced would offset ultimately the outlay or the value of the property calculated as at some set date. The difficulties of applying any such principle to the cases of unproven mines gave rise to a great deal of discussion of the fact that the difficulties already experienced in the practical application of this method in the United States would surely be greatly enhanced in the case of a country such as British Columbia.

Dr. Graton Studies British Columbia Problem

In order that the full benefit of previous experience might be obtained in carrying on this discussion, Mr. Mortimer-Lamb submitted the whole problem to Dr. L. C. Graton, and the subsequent discussion was greatly benefitted by Dr. Graton's public-spirited response. Dr. Graton said:

"If taxes are to continue at their present heavy rate, and if the mining industry is to survive under the burden, it will be necessary, in my opinion, to grant depletion as an annual deduction regardless of whether the total previous depletion deductions may have equalled already the original purchase price of the property or some valuation put upon it at some preceding date. Since the fundamental object of depletion is to return to the tax-payer exempt from tax his original capital value in the property, it might seem on first thought that when the total of this capital value has thus been reached through the accumulation of annual depletion deductions, he should be entitled to no further depletion. But as everyone who understands the mining business realizes, for each productive mine there have been many prospects into which money has been put, but which have returned little or none of it, but the investigation of these numerous cases that eventually proved to be failures was a necessary part of the process by which the relatively small number of successful mines was found. If the losses involved in the failures have to go unrequited from the tax standpoint, and if all the profit from the few successes is taxed heavily after the cost or value of that single success has been returned by depletion, the mining business as a whole,—which is and always must be a mixture of many failures and a few successes,—will languish; the business of ore-hunting will be abandoned, and only those new mines that are discovered by merest chance will come to light, and the number of those will decrease steadily.

Depletion Allowance Should Remain as Long as Mining Continues

"Specifically, then, my feeling is very strong that depletion should be maintained so long as a mine is productive. Let us assume that a given property was purchased five years ago by the present owners for a million dollars, and let us assume that the price then paid was a fair price as judged by the apparent ability of the mine at that time to yield profit. Suppose the mine since that time has produced all the ore that at the time of purchase it could be estimated to contain, and that the profit

realized from the production since purchase has actually justified the purchase price. Theoretically, then, the mine ought to be just exhausted and if it has been paying tax and been receiving the benefit of depletion deduction based on cost, then the total depletion deduction so received should now exactly equal the purchase price.

"But suppose instead of being exhausted, the mine now contained as much ore with as great a prospect of profit as when it was purchased five years ago; in other words, the enterprise, intelligence and courage of the management had brought to light new ore that could not properly be included in the valuation five years before. In such a case, the mine will continue to produce after all its depletion based on purchase price has been used up, and will have to pay a tax on its full income without depletion.

"Alongside of it there may be a mine having ore of the same grade and character and capable of extraction at the same cost. This second mine may have been purchased only recently and therefore still possesses a depletion reserve based on cost. The two mines will therefore have to pay on a wholly unequal footing. The first mine will have to pay a tax on its entire net income without depletion, the second will deduct depletion before computing the tax.

"It is idle to argue that a case of this sort is sound and fair, yet cases of this sort are bound to arise frequently, because mines can never be fully measured as to value at any given time. There is always the possibility, and in many cases the probability, that the measurable reserves to-day will be greatly exceeded in the future.

"There is only one way to obviate this unfair distribution of the tax burden, namely, by granting depletion steadily as long as production is maintained. Intelligent and fair-minded analysis of such a program will show that there is nothing unfair about it either within the mining industry or to taxpayers outside that industry.

The Problem of Valuation

"The difficulties of valuation for purposes of taxation have been found to be such as to lead to results that are never satisfactory; that necessitate repeated and frequent adjustment, and that cost for their administration a sum wholly out of proportion to the requirements of the case. If some simple or more or less empirical method of computation of depletion allowances could be arrived at, many of the difficulties of administration would be eliminated. The suggestion has been made frequently that a flat rate of depletion of so many cents per pound or per ounce of metal be given to all producers. Two cents a pound for copper would be a fair depletion for some of the long-life porphyry mines in which the actual present value of the profit per pound is low. Two cents, on the other hand, would be an inadequate depletion for some rich mines of relatively short life. This scheme, therefore, while possessing certain advantages of simplicity, is inequitable.

"The simplest scheme of all, and the one that approaches closest to an equitable distribution of the tax burden, is to allow as depletion a given percentage of net operating income each year. Detailed investigation of the relation between operating expense and selling price and the ore reserves capable of estimation, of all the important copper properties owned by companies incorporated in the United States, indicates that if the annual depletion allowance be put at 33 1-3 per cent of the net operating income, just about the same results will be achieved in the long run as if exhaustive valuations were made for each property. The consequence of such a method of depletion determination would in the first instance be this:—Suppose copper sells for an average of 16c a pound during a given year and suppose the operating costs of production for a given company average 10c per pound, leaving a net operating profit of 6c per pound. One-third of this granted as depletion, or 2c per pound would leave 4c from which to deduct depreciation which might be, say 3-4c, the tax to be paid on the balance of 3 1-4c. A Company, then, producing 10 million pounds with a net operating expense of $600,000 would be granted $200,000 of that as depletion, $75,000 as depreciation and would pay tax on $325,000. If during the next year the price of copper should increase to 20c while the costs of production, which lag behind the changes in selling price, increased to only 11c a pound leaving a net operating profit of 9c, depletion would increase to 3c a pound, depreciation would remain at 3-4c and a tax would be collected on 5 1-4c of profit. On the other hand, in a year when the selling price declined to 12c and costs could not be reduced below 9c, giving a net operating spread of 3c, depletion would be 1c a pound, depreciation still 3-4c and the tax would be paid on 1 1-4c of actual profit.

Depletion Allowance of 33 1-3% of Net Operating Income is Fairest to All

"This would mean that in periods of normal profit mining companies would pay a normal tax. In years of high profit they would pay a high tax, but they would also, as is proper, actually or theoretically accumulate a larger sum for their depletion reserve. In periods of low profit they would pay a lower tax and likewise put by a smaller depletion reserve. This is all as it should be, in accordance with sound economics. Furthermore, suppose that by the present scheme of basing the depletion allowance on cost or valuation, a given company has a depletion allowance of 3c per pound. If the difference between operating cost and selling price is fairly small, the company's operating profit may actually be insufficient to cover its depletion and depreciation and, therefore, it would pay no tax. In the case, therefore, of a government dependent in considerable measure on the tax it collects from the mining industry, the Government might receive no tax whatever from that industry in periods of fairly low prices, even though the mining companies were actually making some money. The plan of charging depletion on the basis of a percentage of net operating income serves the advantageous purpose of equalizing the high points and the low points, giving a reasonably steady income, and imposing on the taxpayer a burden fluctuating less widely.

Scheme is Simple and Economical

"The scheme has one other enormous advantage from the standpoint of administration. It is a fairly simple matter for a tax bureau to ascertain the total receipts and the total operating expenses of a given company,—in other words, to ascertain the net operating income. It is a far more difficult matter to administer depletion as it is being handled in the United States at the present time. Depletion without the benefit of discovery will soon put an end to the mining business if taxes continue to be heavy. The administration of the discovery clause in the United States law has already almost wrecked the Revenue Bureau and has worked great hardship on many Companies. All this trouble and effort would be eliminated by the percentage method. The year's balance sheet would suffice for everything and a simple computation would clear away the question of depletion, I believe to the satisfaction of all concerned.

"Mr. James C. Dick, who was for a considerable length of time in charge of all the mine valuation work in the

United States Revenue Bureau, is thoroughly convinced, as I am, that the method of computing depletion as a fixed percentage of operating income is the simplest, fairest and best method. Mr. J. A. Grimes, at present a member of the Revenue Bureau in Washington, who has given more thought than anyone in the Bureau to this problem of mine valuation for taxation purposes, also favors the percentage method, primarily from the standpoint of simple administration and also as the simplest method of obtaining fair play for all concerned."

Dr. Graton Explains 33 1-3% Depletion Allowance

The recommendations embodied in this letter were submitted in the first place to every mine operator in the Province, and were accepted unanimously. They were then submitted to the representatives of the Finance Department of British Columbia at a metting held at Victoria in February last, and it is not surprising perhaps that immediate recognition of the advantages to be obtained by the depletion percentage method was not realized. The Government in fact asked for an explanation as to how the arbitrary rate for depletion of 33 1-3 per cent of the operating income had been arrived at; how it could be shown that the method would apply equitably in the case of all mines, and whether the revenue derivable by the Government under this system would be less than if either the cost or valuation system were employed. These questions were referred by Mr. Mortimer-Lamb to Dr. Graton, who replied as follows:—

"The figure of 33 1-3 per cent. for depletion was arrived at in this way:—Very complete data of all copper companies that had yielded a profit over a considerable period of years were on file in the Bureau. From these data, supplemented in a great many instances by much further correspondence and by many personal interviews with engineers or managers of the companies, valuations were arrived at for the purposes of depletion, and in this way a depletion allowance per pound was established. To arrive at the valuations it was necessary, of course, to determine the estimated average operating profit per pound. A comparison, individually and in the aggregate, of the relations of the depletion allowance and the operating profit (which relation would be the depletion percentage) indicated a maximum range, as I recall it, of some 21 per cent. to 47 per cent,—the lowest figure applying to a property having such a vast tonnage of ore developed that only such portion of it as would probably be mined in the next 40 years was assigned any value whatever, and the highest percentage applying to a mine already practically exhausted and possessing at that time a richness of ore which probably had never been equalled by an important producer theretofore. These two extremes were so decidedly extreme that similar examples would rarely be encountered. As a matter of fact neither of these mines is within the United States and one of them is not on the North American continent. The great majority of the mines investigated were found to fall within the range from 25 to 40 per cent. and there was a striking concentration in the range from 30 to 35 per cent.

"The general field of silver, lead and zinc mines was also studied, but not as thoroughly as in the case of copper. Some of the small, short-life zinc properties in Oklahoma gave percentages running into the 40's, and I believe one or two exceeded 50 per cent; but in general an average in the neighbourhood of 33 1-3 per cent. seemed fair. So far as I recall, no analysis was made of the situation with respect to gold mining.

Difficulties of Individual Valuations

"It is, of course, evident that a fixed rate will apply exactly to very few companies, if any; some ought to have more, some less. The whole question hinges on whether the degree of inaccuracy involved in the assumption of an arbitrary flat rate is sufficient to balance the difficulties and delays and the added expense both directly and indirectly, to taxpayer and to government in endeavoring to arrive at specific valuations and depletion allowances for each individual case. My own experience has led me to conclude that there is no feasible middle ground; one extreme or the other must be adopted. If certain mines were to be put in a 40 per cent. class and certain others in a 30 or 25 per cent. class there would be a perpetual squabble with respect to the innumerable border line cases. The classification you say the Dominion Government has adopted undoubtedly does permit the application of different percentages without much difficulty, though I should be interested to know how a mine would be treated that produces copper with silver as an important by-product. Furthermore, in this instance I feel confident that if the Canadian copper mines are on similar footing with those in the United States, a 25 per cent. average depletion is too low for them when considered in comparison with the entire exemption of cost of raw materials for other industrial enterprises. Moreover, the distinction made between gold and silver mines, on the one hand, and copper mines on the other, of course, works out to increase doubly the burden on the copper mines; not only is a larger proportion of their annual income subject to tax, but the tax they have to bear is larger also because of the failure of gold and silver mines to have paid a proportionate share toward the total.

"As a rule the shorter lived mines, to which, other things being equal, a higher percentage of depletion should apply, commonly prove to live longer than the time that could fairly be assigned to them on the basis of ore reserves at any specific time. On the other hand, mines of very long life, for which a lower depletion rate might seem proper, generally operate on a low margin of profit and therefore are likely to be very seriously affected by adverse market conditions or by any slight failure to realize the estimates; there is, in consequence, an element of hazard that attaches to their enterprise quite as much as that which hangs over the short lived mine. A depletion rate too low would fail to take proper account of this feature.

Percentage Method Gives Fair Average Valuation

"The percentage method of computing depletion operates to correct automatically any errors that might be involved in valuations upon which the particular percentage figure is based. Suppose, for example, that in the case of a given mine the estimates of cost, selling price, tonnage and grade of ore, and life were such as to indicate an operating profit of 6c per pound on copper and a depletion allowance of 2c. If all of the estimates used in reaching these figures should prove in the course of time to have been correct, then a depletion allowance of 2c per pound would have been exactly fair; but if the grade of ore actually turned out to be higher than had been estimated, or the average selling price greater, or the operating costs less, then a 2c depletion per pound would not have been fair; a higher figure should have been granted. On the other hand, if the grade of ore was less than had been estimated, the costs higher, or the average selling price lower, then 2c per pound would have been too large a depletion.

"If, on the other hand, instead of using the 2c depletion rate, the ratio of this to the operating profit of 6c—namely, 33 1-3 per cent.—had been used as the depletion factor and applied to the operating profits each year, then practically all the errors involved in the original valua-

on would be adjusted automatically so far as depletion concerned.

ercentage Method Gives Steadier Income from Taxes

"With regard to the actual amount of revenue the rective systems would yield, it is probably impossible to peak with precision. The method of individual valuaons and of specific depletion allowances in cents per ound or ounce will yield the estimated income only in year when the actual outcome with respect to selling rice, cost, production, etc., accords exactly with the averges used in the valuation. In years when the profit to ne companies is greater than the average so estimated, he tax will be high because the depletion allowance is ixed. On the other hand, in years when the profit to he companies is less than the estimated average, the tax eceived by the Government will be low for the same reaon that the depletion is fixed, and when the operating profit equals or is less than the depletion allowance there will be no tax whatever.

"With the application, however, of depletion on the percentage basis, revenue to the Government will be much more even, and this undoubtedly is highly desirable. In the average year (if such a thing ever happens) the tax will be exactly what was estimated. In years of high profit the tax will be greater, but not so much greater as by the specific depletion allowance method. In lean years the tax will be correspondingly lower than the average but not so low as by the specific depletion allowance method, and the Government's income will never be zero unless the mines earn no operating profit whatever. This smoothing out of the extreme fluctuations in the tax burden on the mines and of the revenue from mines to the Government—fluctuations that are likely to be on the whole greater for the mining industry than for almost any other—is, I believe, one of the principal advantages of the percentage method.

"Unfortunately I cannot give you specific figures as to the actual comparative advantages of the two systems from the standpoint of the Government, principally because no such figures exist; but if one will take into account the great expense of administration by the method that demands individual valuations, it seems that he cannot fail to believe that the Government will be far better off in the long run if it adopts a simple percentage method.

Dr. Graton Commends Association's Effort Toward Uniformity

"It seems to me that your associated companies are exceedingly wise in agreeing to a common basis for the common good. I believe that if their position should be accepted by the Government, the net amount of tax secured by the Government over and above the expense of collecting it will be greater; yet the tax burden to the mines will be less than if an effort is made to arrive at a more precise determination of the tax in each individual case. If a depletion percentage were to be adopted now, the troublesome matter of depletion would be practically solved for all time; but on the other hand, as the experience in Washington has clearly shown, an attempt to compute the specific depletion for each company, although it would appear to be settled once and for all, as a matter of fact is never settled. Individual companies have had conferences with the Government officials almost without number. There have been in addition at least five or six hearings on the subject of depletion, and now the Bureau is preparing to reopen the entire matter and make radical changes in the basis of computations that were previously established;— in short, to tear down all that has been accomplished and build up a new structure. This not only costs money directly to the government and to the taxpayer, but it aggravates what is probably he most unfortunate feature in the whole field of taxation, namely, uncertainty."

The Search for a Satisfactory Method

The whole question was discussed again at a meeting with the Government officials in July last. The upshot of this investigation to-day is that the Government of British Columba has decided to adopt for the present the Dominion system of taxation in relation to depletion. pending future arrangements by which it may be possible to arrive at some uniform method.

The above is, in brief the history of an active campaign carried on by an organization that is justifying its existence in a way that is an example to others. The subject is an interesting one, and it is one that concerns not only British Columbia but the whole of Canada at a time when outside capital is being sought for the expansion of the country's mineral industry. It is hardly correct to say that the industry is being taxed out of existence; but on the other hand the advantages assured by the evidence of sympathetic treatment by the Government in the manner of taxation cannot be too greatly stressed in its importance to the arousing of outside interest. As has been pointed out, it is the mining industry as a whole that is to be considered. It has been said truly that the original attitude adopted by the Mining Association of British Columbia was to take the fullest advantage of previous experience.

The United States has taken the lead in this matter of depletion allowance, and has done valuable pioneer work, looking to a reasonable solution of the problem. With a degree of thoroughness that reflects the greatest credit upon the whole organization concerned, the efficacy of the cost or valuation method has been probed to the uttermost, and the machinery for its application has undoubtedly afforded an example of meticulously careful organization. It has, however, proved to be cumbersome, it has failed to achieve satisfactory results, and it has given rise to a great deal of ill feeling and dispute. In other words, the valuation of mines as at any specific date is too costly an experiment for any Government to undertake, and if some fair compromise can be arrive at, the experience of the past is sufficient to point to the advisability of its adoption.

Dominion Regulations

In its recognition of this fact the Dominion Government is to be cogratulated, and in the system it has adopted it has gone a long way towards what would appear to be the best solution of the difficulty. In its differentiation, however, as between gold and silver mines on the one hand, and mines of the baser metals on the other, there would appear to be a gratuitous invitation to trouble. Take, for example, the mines of British Columbia,—these certainly can not be classified as between gold and silver mines and base metal mines, for there are gold-copper deposits and silver-copper deposits in addition that would provide notable exceptions in the application of the arbitrary distinction. The Dominion Government regulations allow a deduction of 10 per cent. for depreciation There is an additional deduction from the remainder of 50 per cent in the case of gold and silver mines, and, in the case of baser metal mines, 25 per cent., of the net operating income, as being tax free as an allowance for the depletion of the mines. The only excuse for this differentiation is that the baser metal mines might be considered to have a longer life than the gold and silver mines; but, especially in view of the lack of clear defini-

tion between the classes above referred to, this distinction is not really practicable, and further it is very doubtful whether it would react to the benefit of the Government or not. On the whole, therefore, it would appear that the adoption of a Dominion-wide regulation by which 33 1-3 per cent. of the net operating income from mining operations is considered as being tax free in recognition of the wasting nature of mineral assets and the well-known risks of mining, is the fairest and most attractive tax regulation at which a Government interested in the promotion of its mineral industries could possibly arrive.

The progress of the above investigation has been trace in some detail to show how this idea of depletion cam into the calculations, and how the percentage deductio from income has been arrived at; but the whole matte resolves itself into a recommendation to the State tha income from mining operations should be taxed at a re duced rate of 6.66 per cent. for the purpose of encourag ing capital to run the risks of developing our mineral re sources.

The Uses of Concrete In and Around a Coal Mine

I — Surface Structures

By LUKE LINDOE*

I have been asked by the editor of this magazine to write a brief article on "The uses of concrete in and around coal mines". At the outset I would say that the writer is more familiar with the actual construction details than with writing about them, and doubtless among the engineers who read this article there is a large percentage who, on being asked to perform a similar task, have been confronted with the same difficulty of putting down in readable form the things they do and see every day of their lives. However, it has to be written, and it is hoped the brevity will conceal the journalistic inability of the writer.

Concrete has become, in recent years, one of the most valuable construction materials we have, in every phase of industry, and it is probable it will be used eventually in the mining industry as fully as in any other. Indeed, when one looks around a modern mining plant he finds that its adaptation here has probably kept pace with that in any other enterprise. Its variety of uses under a diversity of conditions, its comparatively reasonable cost and the ease with which it can be placed, offers the mine operator a real service, which he has not been slow to grasp.

In an article of this length only the uses of concrete in cases peculiar to coal mines can be discussed; but it should be mentioned that the structures above ground are usually designed to conform to standard requirements for similar buildings at other industrial plants. Warehouse, oilhouse, hoist houses, etc., follow closely

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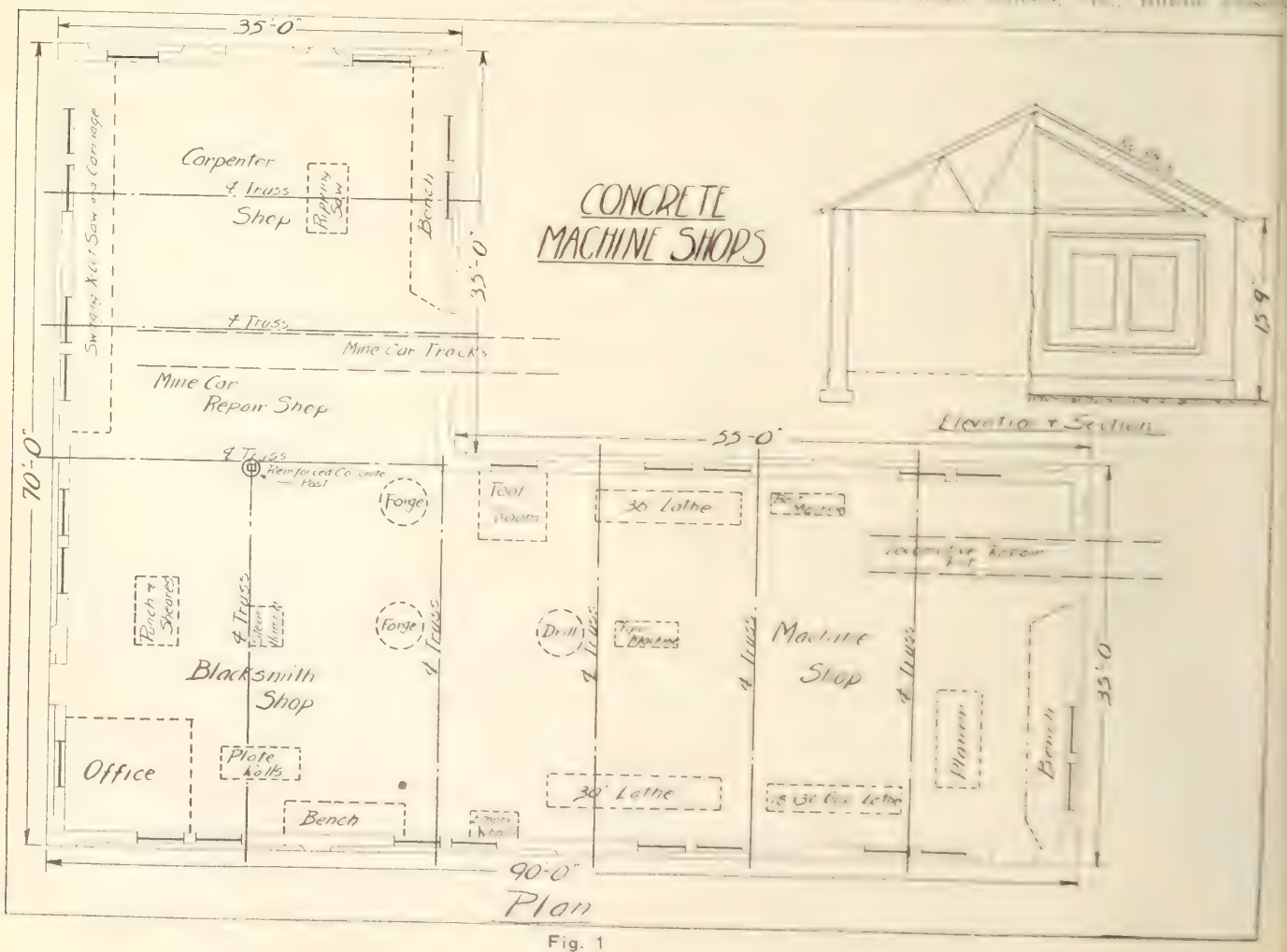


Fig. 1

the one-story factory design found elsewhere. On account of the limited requirements, the blacksmith, carpenter, electrical and car repair shops are placed under one roof. A typical layout is shown in Fig. 1. In this building, light steel trusses support the large spans, the roof proper being galvanized sheets laid on 1½" planks.

The buildings deemed peculiar to coal mines, though found elsewhere, are fan houses, powder magazines, bath houses, lamp houses and tipples. In the case of the last, local conditions and market affect the design to such an extent that no description will be attempted, the design usually being left to the specialist in this line.

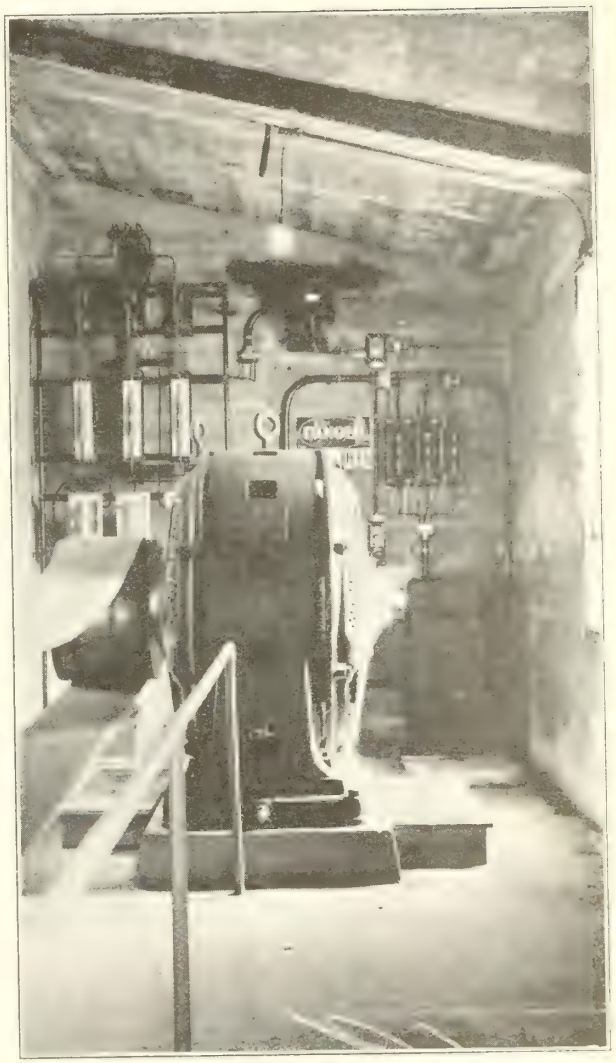
The tipple is probably the most important unit in the surface plant of a mine, as any cessation of operation here will affect the whole operation. It is for this reason that concrete and steel is replacing the old timber type of a decade or two ago, — promoting the longevity of the structure and the continuity of operation so necessary in this important unit of a mining plant.

Fan Houses

In the past, fan houses, fan drifts, etc., have been built usually of brick or stone, and in some cases even of wood, and while fine structures of this type can and are built, they develop faults not common with concrete, which prohibits them from being classed as ideal for this type of building. Often through age, settlement and cracking of walls or the use of poor or wrongly applied mortar, the joints between bricks or stones become leaky, permitting short-circuiting and wastage of air, with a consequent loss of efficiency in the fan. Not only is the air wasted, but the walls, once weakened by the loss of the adhesive properties of the mortar, are difficult to maintain intact.

Concrete lends itself admirably to this type of building, as fan drift, fan house, motor house, air-locks etc., can be cast as a monolithic mass and therefore are airtight and enduring. Little or no wood need be used in conjunction with it, — a valuable feature when a fan is placed, as it usually is, in an isolated situation in wooded areas where fires are a constant menace. There are no excessive load strains on the superstructure; the walls can therefore be kept light, placing the cost on a comparable footing with any other materials, considering durability, efficiency, and fire hazard

Concrete Fan House



Motor Room of Fan House

The accompanying photographs show a recent installation at one of the large western mines, designed to comply with the Alberta "Mines Act", whose regulations require that the fan be placed at one side of the line of the mine airway. To fulfil these requirements a 45 deg. deflection horizontally and a 30 deg. deflection vertically was placed in the fan drift, thus placing the fan itself well out of line of the force of an air blast should an explosion occur. Explosion doors are placed at this intersection to break the force of the blast. The walls are of plain concrete, 10" thick, resting on adequate footings, these footings being stepped where the drift conforms to the 30 deg. pitch of the seam. Roofs are of 6" reinforced slabs, with ⅝" bars turned at the ends and projecting into the walls and spaced 9" centres. On the fan drift roof, since the span is rather wide, the roof is given a camber of 6".

For the repair of old brick or masonry fan drift walls that have commenced to disintegrate and have become leaky, as mentioned above, cement mortar applied with one of the compressed air machines now on the market, offers an easy and economical means to the end. Sections of the wall are picked out, removing the old mortar

to a considerable depth, and these joints are then forced full of the cement mortar. The wall surface is also covered to a depth of about ¾", thus presenting a smooth surface for the passage of air, and tending to stiffen the wall considerably.

Powder Magazines

As the regulation and inspection of powder magazines is likely to become compulsory throughout Canada, a discussion of this type of building might be of interest at this time. In the main, the desired features to be incorporated in a magazine are, that it be burglar-proof, fireproof, well ventilated, simple in construction and that it afford an easy means of handling stocks.

Here again concrete gives us an excellent medium. It has strength above other building materials, it lends itself to simplicity of design, and a concrete building can under similar conditions be kept cleaner than others, and is resistant to fire.

Col. Ogilvie of the explosives department of the Dominion Government issues a plan of a building which they consider satisfactory, and which, I believe, they intend to adopt for their own use. The principles of construction of this building are shown in the following sketches. (Fig. 2). Concrete is used throughout. Plain walls, 12" thick at the base tapering to 8" at the top, rest on footings sent down to a good bearing. The roof is 6" thick, re-inforced with ½" round bars spaced 6" centres and curved as shown. Double elbow galvanized ventilators, 3" square, with gauze inside are placed near the floor and roof. A floor slab 6" thick is laid over footings and on a well tamped rock back-fill, and graded to the front of the building. A partition wall to form a vestibule for clothes, brooms, etc., is placed at a convenient distance from the front wall, which contains the only entrance and is fitted with a bullet-proof boiler plate door.

It is prohibited to store detonators in a building used as a powder magazine; but this ruling is subject to slight modification. In the magazine shown, an old safe embedded in a mass of concrete at one side of the anteroom making what is virtually a separate building, and utilizing some waste space, is used for the purpose.

All interior surfaces are washed with two coats of cement wash to provide smooth surfaces against the accumulation of dust. All bolts have round heads, nuts being placed on the inside. Figure 2 gives the plan and dimensions of a building to hold about 10 tons of powder

Bath Houses

The provincial mining laws require that at mines where a certain number of men are employed below ground, provision shall be made for them to bathe and change their clothing. The bathing facilities and the general layout of bath houses are largely affected by local conditions and the likes and dislikes of the men in the places where they are situated. Some men prefer showers, others tubs. It will be seen therefore that

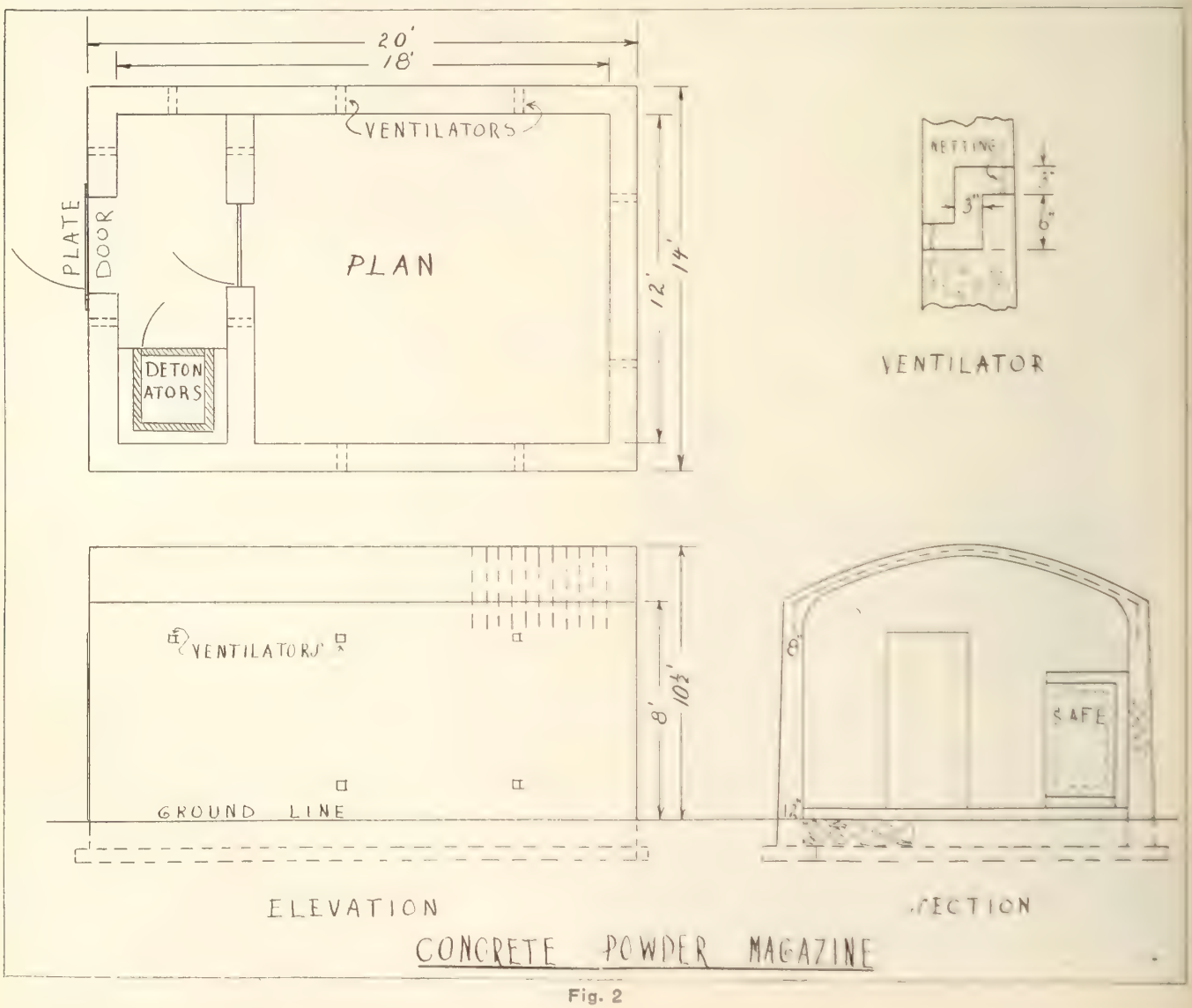


Fig. 2

his building, unlike most designed for some particular urpose, should be constructed to suit the requirements a particular lot of men.

Nearly all the employees of a mine use the bath-ouse, whether working below or above ground; but echanics as a rule do not require to perform com-ete ablutions each day, and basins for a partial wash-p should be supplied. The men of some localities ight prefer to have the usual steel lockers, while hers desire the more modern method of suspending the men while changing. Large ventilators are placed in the roof, and to assist this ventilation the windows are made to open from the inside.

As mentioned before, whether floor lockers or suspended hooks are used, the design is not materially affected; but in this case bottomless lockers or containers at the ceiling are used, into which clothes are hoisted when not in use.

Lamp Houses

While it may not appear at first thought that the requirements of a lamp house are exacting, there are certain conditions that have to be met if the building is to function properly. On account of the gasoline and other oils used in safety lamps, the building and interior fixtures should be of fireproof construction. Not only this, but the exterior walls should be so arranged that, should a fire start inside, it can be isolated as much as possible. This can be attained by having the floor,

Concrete Powder Magazine

he clothes near the ceiling on hooks, which in turn are laced within individual, bottomless containers. The system adopted, however, does not change the design of the building much, the walls being higher where clothes are hung at the ceiling. The requirements for all are the same: it should be laid out so that it can be cleaned thoroughly each day, and it should afford ample space for the required number of men to wash and change without confusion. What is probably of prime importance to the owner is that it should be built of materials that will be impervious for a long time to the effects of large volumes of hot, soapy water with its consequent steam, and that its floors be so built and drainage laid out and maintained so that this water can be removed from the building quickly and efficiently, and not escape through floors and walls to create a nuisance and so hasten the decay of the building. Another requirement from the same standpoint is that it should be made as attractive to the necessities of the different users as possible, so that all will use it, thereby making it not only a utility but a successful financial investment as well.

Fig. 3 gives the general layout of a concrete wash house, designed for both showers and basins. A lean-to on each side of the main or changing room furnishes a shower room on the one hand, a wash-up room on the other. These lean-to's are separately ventilated and heated, and having a wall interposing between them and the main building insures that men changing are not splashed by the showers. The concrete floors and walls permit of easy cleansing by simply flushing with a hose. Walls are also kept painted white, thus assisting in cleaning and lighting. Floor drains at the sides carry waste water to drains laid in a suitable position under the floors. Toilets are furnished with floor type closets, to facilitate cleaning, and the vestibule has automatically closing doors to prevent draughts playing on

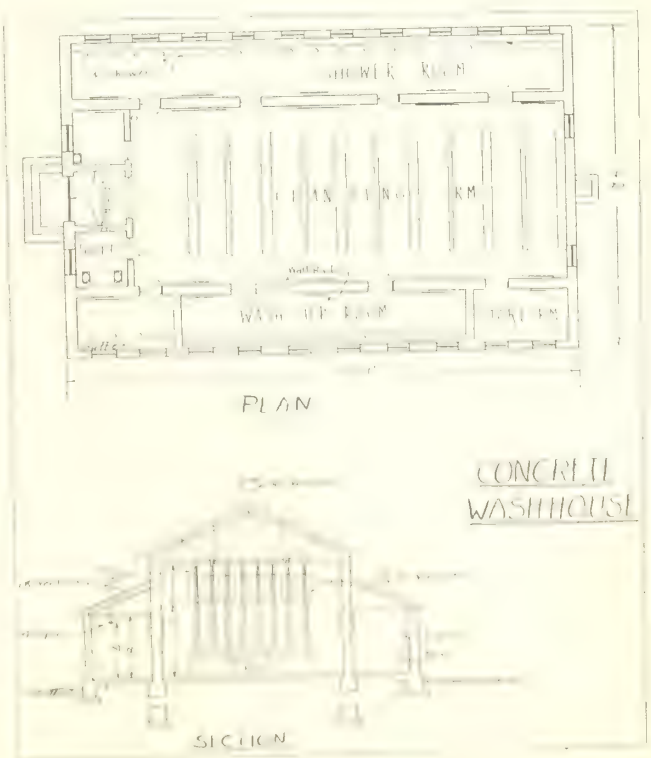


Fig. 3

walls and roof all of concrete, with the windows and door fitted on the outside with light steel or iron shutters that which can be closed when necessary.

There are periods of intense activity in the operation of a lamp house, as when lamps have to be given out to all the outgoing shift of workmen, and received and examined from the incoming shift, all within a period of 30 minutes or less. Usually each workman is allotted a lamp which he uses every day, and this lamp must be found easily and quickly, which necessitates a convenient interior arrangement. Cleanliness, too, is important, to promote efficiency and to prevent fire hazard.

A lamp house is usually small and of simple design, and concrete is particularly suitable for its construction, owing to its fire resisting properties, and the ease of erection where a simple design is adopted.

For the safety lamps, steel revolving drums placed vertically, with numbered niches, each drum to hold 100 lamps, can be placed at a wall in a convenient position to give out the lamps as the workman calls the number at the wicket.

For the electric lamps, charging racks, placed at about 48″ centres and carried out from the wall about five feet, give a convenient arrangement. The charging rack is also numbered with the number of the battery it holds, the cord and headpiece being attached on a hook immediately below.

NEW TYPE OF INGERSOLL-RAND DRILL CUTS MINE AND QUARRY COSTS

For several years there have been few improvements in the method of putting down deep holes in quarrying except the gradual substitution of compressed air power for steam in driving the reciprocating piston drill and the gradually increasing use of hammer drills. There has recently been developed for this class of work and for heavy drifting and tunnelling jobs, a very powerful hammer drill, which has established a remarkable record wherever it has been introduced. Results show that on quarry work alone it has equalled the daily footage of at least two large piston drills. This accomplishment has created a new era in quarrying because it has increased production and lowered costs.

The drill responsible for this radical advance is known as the Ingersoll-Rand X-70 Leyner Ingersoll-Drifter. It appeals particularly to quarry men, because in many rock formations it can be operated satisfactorily without water. This is sometimes an important consideration, especially in cold climates where pipe lines freeze in the winter. On the other hand, where conditions warrant it, water can be utilized.

The simplicity and ease of operation of this new drill wins favor with the drill runner and its rugged construction with consequent negligible upkeep cost and ability to stay on the job, are important features that carry weight with the men who pay the bills.

Designed with ample hole cleaning capacity, it eliminates the time consumed by the use of the separate blow pipe. For the shallower holes, a push button blower device is provided which is conveniently located and easy to operate. For cleaning holes 20 ft. to 30 ft. deep during dry drilling, a special feature makes it possible to draw air from the air chest and to send it continually down to the bottom of the hole, thus effectually removing the cuttings.

An extremely powerful "Sergeant" rifle bar rotation reduces to a minimum the tendency of the drill steel to stick by reason of any faults or seams in the rock; in fact, actual experience has proved that this new drill bottoms the steel to the last inch.

This drill has been employed in mines and quarries with equally good results. At a New England trap-rock quarry, one X-70 replaced four 3⅝ inch piston drills. At another quarry, also in New England, an X-70 does more than the three 3¼ piston drills formerly used. A third New England quarry reports that one X-70 does the work of three 3⅝ inch piston drills. At an Eastern quarry one X-70 is averaging about 180 ft. per day, and at another limestone quarry in the South, one X-70 machine is doing the work formerly accomplished by three 3 inch piston drills. There are now five of these new drills in this quarry. This drill has also proved very successful for drilling and broaching granite. These machines have also recently been installed at various Canadian mines and quarries and their records are readily obtainable by those interested.

Its field is not restricted, however, to quarrying alone.

Ingersoll-Rand X-70 Drifter on open-cut work. Note long steel at the right

It is being used extensively in mining and tunnelling where large, hard rock headings require cut and lifter holes of over 12 ft. in depth. It has also proved very successful where difficult rotation problems are encountered.

There are quite a number of these drills now being used in Canada and other parts of the Empire. In a mine in Newfoundland this new machine recently accounted for 245 ft. of hole in six hours. An average footage of five other different drills in use at this mine on the same day was 137 ft.

The X-70 Leyner-Ingersoll-Drifter is made by the Canadian Ingersoll-Rand Company, 260 St. James St., Montreal, who will gladly furnish additional information to any reader interested in machinery of this type.

CARBON BLACK PLANT

The Sarnia Oil and Gas Company have obtained permission from the Commissioner of Natural Gas for Ontario to erect a plant for the manufacture of carbon black at their wells near Sarnia. This will be the first attempt to make carbon black in the British Empire.

A NEW FERTILIZER

An English inventor, E. Lloyd Pease, of Darlington, has worked out on a small commercial scale a method of making a mixed fertilizer containing nitrogen, phosphates and potash. The nitrogen and phosphorus compound is obtained by using crude phosphoric acid in gasworks scrubbers instead of sulphuric acid. To this is added potassium sulphate obtained separately, and the mixture is absorbed in a suitable carrier. If peat is used to absorb the fertilizer, a substance somewhat like barnyard manure results. No definite figures of cost are available as yet.

The Quebec Asbestos Industry

III — The Recovery of Fibre at Present Lost in the Milling of Asbestos

By G. ERNEST BOOKER

(concluded from page 589)

Having considered briefly the use of a dust chamber as a means of fibre recovery in its simplest form, it is advisable to look into the other methods by which similar results may be obtained. The process of electrical precipitation is one that, up to the present, has not been utilized in the asbestos industry on a commercial scale. Its merits warrant serious consideration.

Development of Electrical Precipitation

The idea of electrical precipitation is by no means new although it is only since 1906 that it has been brought to the aid of industrial activities. As far as is known, the original discovery was made by Hohlfeld in 1824, who discovered that if smoke were passed through an electrical field, the solid matter suspended in it was deposited and the gases became clear. Twenty-five years later Guitard brought the discovery to the attention of the public again, but the matter was apparently forgotten until Sir Oliver Lodge brought the subject up again in 1884. His experiments were the basis of the first British patents, but even these were neglected for another twenty years. Since 1906, however, much more has been learned and the results of the work of Dr. F. G. Cottrell and Sir Oliver Lodge are such that today the process of electrical precipitation is employed in an extensive way in many industries where dust is held in suspension by gases or air.

The Western Precipitation Co., who control the patent rights in Canada, have already done considerable experimental work in the precipitation of asbestos fibre and are confident that a recovery of 90 per cent may be obtained by this process.

Electrical Precipitation for Asbestos Mills

The basic principle of the process is absolutely independent of gravity and consists in the attraction of electrically charged bodies for one another. Thus a particle of matter, if electrically charged, will even oppose gravity and travel upward; but this is not desirable, and so generally a middle course is chosen.

The dust and fibre-laden air is led from the mill as in the previous case and enters the precipitation plant (see Fig.) the velocity of the air being reduced to a certain extent as before. The air, moving at a velocity of say 250 feet per minute, then passes through an electrical field, created by a high potential, unidirectional electric current, the electric current flowing through the dust-laden air between two electrodes oppositely charged. Each and every particle of solid matter suspended in the air becomes charged in this field and is driven by the force of the charge to one electrode and is deposited thereon, the clean air passing on, unaffected, to the atmosphere.

The fibre and dust thus deposited on the electrodes is released from them by vibrations set up in the electrode by a rapping device provided for this purpose. The fibre falls into the hopper, from where it is carried by means of a screw conveyor back to the mill to be cleaned, graded, and packed for shipment as before.

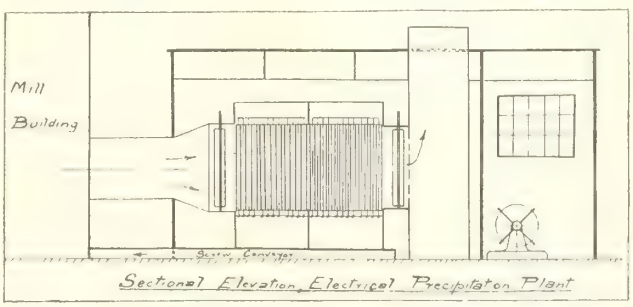
Cost of Installation

The entire equipment is housed in one building and may, if desired, be placed in the mill building itself; but in view of the fact that the space available in existing mills is very limited, the installation of the plant as near as possible to the mill in a separate building is about the best location. The electrical apparatus required for such an installation would include a mechanical high tension rectifier and the necessary step-up transformers and switchgear, all of which is housed in a separate room, but in the same building as the precipitator.

The cost of construction and installation of a Cottrell Precipitation plant capable of handling 50,000 cubic feet of air per minute, including the building and conveyor, is approximately $35,000. But even this considerable expenditure would be rapidly wiped off by the revenue obtained from the fibre recovered. Thus at an efficiency of 90 per cent and taking the same conditions as before, one would obtain 9 tons of fibre per day, which even assuming as low a value as $10.00 per ton, would yield $90.00 per day or $27,000.00 per year of 300 working days. Of course the cost of electrical energy to operate, and the cost of the final cleaning and grading of the fibre must be deducted; but even these items do not amount to much when the increased revenue is compared with them.

Possible Additional Uses

The Cottrell process of Electrical Precipitation has a place of importance in the asbestos industry that is not



realized at the present time; and while it is impossible to foresee the extent of future developments it would appear quite feasible to design and operate the precipitation plant in such a way as to separate the fibre into its various lengths and grades as well as to free it entirely from dust, without any subsequent cleaning or grading being necessary.

To obtain these results in a single electro-static precipitator would overcome not only the waste problem as it is today, but also would simplify the process of milling considerably by eliminating much of the machinery at present necessary to carry out these essential operations.

Mechanical Separation

However, it is not the intention of this article to go into the possibilities of the future in connection with milling, but merely to outline briefly the ways and means by which the present loss in fibre may be eliminated; so we shall pass on to the methods that may be employed under the heading of mechanical separation. In order to make this as clear as possible it is as well to give a definition of mechanical separation as the writer sees it.

The mechanical separation of suspended particles of solid matter from the air is their recovery by a mechanical device or devices, by virtue of which either potential or kinetic energy may be given thereto or absorbed therefrom. This is possibly a rather ambiguous definition,

but the field it has to cover is so extensive that the definition must be equally broad.

As a means of recovering fibre, the various available ways under the heading of mechanical separation should be a matter for serious consideration and research; for by such work of investigation only can the most profitable process be arrived at. Already there are highly efficient forms of equipment in use in other industries which might be suitable for the problem in hand.

Centrifugal Separator

The Centrifugal Separator is such a device. This is in general use and is covered by the above definition of mechanical separation, at it utilizes the kinetic energy available in the dust-laden air. It is probably the simplest form of separator known. The linear velocity of the air is changed into angular velocity, which by virtue of its circular path about a fixed point exerts a centrifugal force upon the suspended particles which overcomes their suspension in the air, and results in the separation of the dust and fibre from the air. The dust and fibre are then collected and returned to the mill for further treatment. The average efficiency of this simple separator may be up to 90 per cent. It is the device at present in use in the asbestos mills for the separation of the regular grades of fibre collected from the shaking screens, and its perfection and further application deserve serious study.

Other forms of mechanical separators employing various devices to trap the solid matter and allow the clean air to pass out can be employed to achieve the desired results and efficiency. Some with screening effects, others which by means of baffles reduce the velocity of the air and secure a gravitational separation, all deserve serious consideration.

In conclusion, then, one may state definitely that the present losses of fibre can be remedied fairly simply, and that the recovery of fibre can be more efficiently carried out than at present, with profit both to the individual mills and to the whole of the Asbestos Industry of Quebec.

MAYO TO BE IMPORTANT SILVER-LEAD CAMP

Natural Resources, the official monthly publication of the Department of the Interior, Ottawa, has this to say in its current issue:

During the past winter there have been hauled from the several mines of the Mayo district to the town of Mayo, on the Stewart river, for shipment after the opening of navigation, between eight and nine thousand tons of ore, which it is expected will average about two hundred ounces of silver to the ton in addition to large quantities of lead

The largest shipments of ore were made by the Keno Hill, Limited, the first company to commence extensive operations in this district. This is the third year of their operations and each summer the amount of ore shipped has exceeded the previous year's shipments. Last winter another company, known as the Yukon Treadwell Company, Limited, developed their properties extensively, and the quantity of ore delivered at Mayo for shipment was almost as great as that of the pioneer corporation.

In addition to the mining companies, a number of individuals are slowly developing their properties, and some of them have obtained ore containing values which will permit of shipments being made.

The ore is hauled on sleighs a distance of about forty-five miles. There was used during the past winter for the first time in this district a "caterpillar" tractor, which was found to be very satisfactory. The intention is to utilize additional tractors next winter, and it is estimated that the output will be doubled and about twenty thousand tons of ore will be available for shipment during the summer of 1924.

The United States Government railway extending from Seward on the Alaskan coast to Nenana, Alaska, is now in operation. The ore from the Mayo district, instead of being towed on scows to the mouth of the Yukon river and there shipped to smelters, will be carried down the Yukon river to the mouth of the Tanana river and up that stream to Nenana, where it will be transferred to the railway and thence carried to the Pacific coast. This means a reduction in the distance from the mines to the smelter of approximately one thousand miles. With the aid of tractors for hauling the ore from the mines to the head of navigation, and by using the railroad from Nenana, Alaska, to the Pacific coast, the cost of transportation of the ore will be considerably reduced and will enable a lower grade of ore to be mined and shipped.

Further prospecting on lands not far distant from Keno hills, where the principal mines now being developed are situated, indicates that the areas from which shipments of ore can be made are of considerable extent, and in some instances evidences of large deposits of low-grade ore have been discovered.

All who are interested in this wonderfully rich mining field and who have watched the development of it since 1918 are, as a result of the work of last year, optimistic, and they feel assured that a permanent mining industry will be established that will rank as one of the great mining fields of the Dominion.

NATIONAL MINING CORPORATION AND COMSTOCK

The National Mining Corporation, of London, has decided to call up the unpaid portion of its subscribed capital, amounting to 4 shillings per 8-shilling share. Official reports to shareholders state confidently that very large profits are in sight as a result of the recent investment in the shares of Comstock Merger Mines, formed to re-open old mines on the famous Comstock Lode in Nevada.

GARNET MINING

The mining and milling of garnet by the North River Garnet Company in Warren county, New York State, is described in the *Compressed Air Magazine* for August. The quarry and mill there have been in operation continuously since 1905, previous operations dating back to 1893. The annual consumption of garnet in the United States is about 6,500 tons, of which 6,000 tons is used to make garnet paper and cloth and the remainder as loose sand for polishing and grinding. The rock, garnet gneiss, contains from 8 to 10 per cent. of garnet. Though the difference in specific gravity between the garnet and hornblende in the rock is only three-tenths of a point, a clean separation is effected by means of "vanning jigs" of unique construction.

RECORD ANTHRACITE OUTPUT

The total production of anthracite during the first six months of 1923 was 59,489,439 net tons, and exceeded the output for any corresponding period. It was 11 per cent. greater than the average for the first seven months of the years 1914 to 1921.

THE MINING DISTRICTS

By THE JOURNAL'S CORRESPONDENTS

NORTHERN ONTARIO

Night Hawk. — A statement has been issued by the Night Hawk Peninsular Mines Limited, in which it is stated that practically all of the equipment for the 200-ton mill has been purchased and is being delivered. Rapid progress will be made with construction and it is hoped to start the mill the first of November. The company also proposes to sink a new three-compartment shaft to a depth of 425 feet, which will be completed by next January. Underground developments on the 3rd and 4th levels continue to be satisfactory. On the 300-foot level No. 4 vein has been driven on for 400 feet, with the face still in ore. The average grade is $11.50 over a width of 8 feet. On the 425-foot level driving on the No. 5 vein has shown an average grade of $8.00 over 7 feet, and the No. 4 vein has just been intercepted on this level, where it shows $13.50 across 17 feet. Additional camps and buildings are being erected to take care of the additional men required when the mill begins operations.

Porcupine. — Vipond is making good progress with the overhauling of its mill, and it is hoped to have it in shape to turn over ahead of time. It was originally announced that operations would commence in December, but it is now hoped to begin in October.

During the month of July the output of the Dome amounted to $425,547, which constitutes a new high production record in the history of the mine and exceeds by approximately $4,000 the highest previous month's production.

The Conciliation Board, appointed to investigate the demands of the miners in Porcupine for an increase of twenty cents a hour in wages, reports that it has been unable to come to any decision. It recommends that the matter be referred back to a conference between the miners and employers. This is rather an unusual condition to arise, and probably results from the fact that the miners did not simply ask for an increase in wages, but asked for the Board on the specific demand for an increase of twenty cents an hour, and this, of course, was something that could not possibly be considered by the companies. So far as can be learned nothing has been done regarding any further conferences between the miners and the managers.

The "Blue Sky" Law. — The late Drury Government passed what is popularly known as a "Blue Sky" Law, but did not bring it into immediate effect, so far as it concerns mining stocks. At that time it was announced that if it was considered advisable to bring the Act into effect it would be proclaimed on September 1st by the Lieut. Governor. The present Government has decided not to have the law proclaimed, as it is believed that it would have the effect of giving Government sanction to speculative securities, and that it would retard the development of the natural resources of the Province. When the Act was up for discussion members of the present Government were opposed to it, with the result that it will not now become effective.

Iron Ore Committee's Report. — The report of the special committee appointed to investigate the iron mining industry of Ontario has been forwarded to the Government. The report recommends that in order to encourage the development of the industry a bonus of 1 cent per unit of iron in each long ton of merchantable iron ore, natural or beneficiated, and produced and actually marketed from Ontario deposits, be given. It also recommends that the bounty be paid during a period of ten years, and that half the amount be paid by the Dominion Government. It is pointed out that the Province has a steel industry that is a credit to the country, but that it is entirely dependent on foreign sources of raw material and that this foreign supply is within measurable distance of extinction. This country has very large known and undeveloped resources of iron ore, but at the present time not a pound of ore is being produced in Ontario, or, as a matter of fact, in Canada. Sufficient work has been done to demonstrate that Ontario ores, which consist largely of magnetites which need to be concentrated and sintered, are capable of producing high-grade furnace material, and it is believed that a market can be found for approximately 750,000 tons a year. It is also pointed out that within ten years the industry should be self-supporting, and that the development of this industry, in addition to filling our requirements for an important raw material, would be of great benefit to the Province and would provide much needed revenues for the Railways.

Power for the Gold and Silver Mines. — A recent report by the Ontario Department of Mines on the power developed for gold and silver mines, shows a total of 64,490 h.p. turbine capacity connected to generators. This is distributed among the following companies:

Northern Ontario Light & Power Company	30,140
Northern Canada Power Company	28,000
Great Northern Power Company	4,500
Gowganda Power Company	800
Canadian Associated Goldfields	800
South Bay Power Company	250

In addition to the power developed for the mines, about 54,000 h.p. has been installed by the pulp and paper companies. This amount will be very largely increased in the immediate future, as the Northern Canada Power Company, through its subsidiary, is developing 20,000 h.p. on the Quinze River, and the Hollinger Mine proposes to develop another 20,000 h.p. on the Abitibi River. The capacity of the different electrical stations of the Northern Ontario Light & Power Company is 14,300 k.v.a. and the average load is 9,500 k.v.a. Of this amount Cobalt and South Lorrain mines take 4,550, Kirkland Lake camp 1,750, Pulp mill at Haileybury 2,300, and air compressor station and domestic uses 900.

Cobalt. — During the month of July Nipissing produced 298,000 ounces of silver, which is the record monthly production for the present year. This production has an estimated net value of $168,200, and there was shipped from the refinery bullion with an estimated net value of $159,500.

American tourists have the reputation of being inveterate collectors of souvenirs, and this sometimes

results in embarrassing situations. Last week a party of Philadelphia schoolma'ms were visiting the Nipissing Refinery, and after they had left it was found that a number of sample bars of bullion had disappeared with them. These were finally returned, but only after a good deal of trouble and after the special train, which they occupied, had been held up for some time.

South Lorrain. — Directors of the Keeley have declared a half-yearly dividend of 8 per cent., payable September 15th to shareholders of record September 1st.

NOVA SCOTIA

Canon Scott's Visit to Sydney. — Canon Scott arrived in Sydney in humorous vein and informed the reporters his purpose was to study "clam culture." He will, however, proceed with an investigation into the conditions at the Sydney steel plant and at the collieries. True to the marching orders he received when starting out in his profession, he is trying to be wise as the serpent; but whether he will be harmless as a dove remains to be seen. He has made arrangements to inspect thoroughly the steel works and the collieries. Desiring to travel alone, unaccompanied by any person, he found that this would not be possible, even if it were permitted in a steel plant and a coal mine. His intention is to get to the farthest reaches of the oldest coal mine on the island. What he expects to accomplish by this experience it is hard to understand, as coal mines differ according to the thickness of the seam being worked, more than the length of time they have been in operation.

Good Working Conditions in Sydney Mines. — If in the inside workings of the mine Canon Scott expects to find high temperatures and bad conditions, he will be very much surprised, and it may be agreeably disappointed. The Cape Breton collieries are nearly all well ventilated, and as permitted explosives only are used, the mine atmosphere is free from smoke. There is little heat and the places are more comfortable than any city or town on the American continent in the heat of summer or in the dead of winter. The temperature at the pit bottom varies from 55 to 70 degrees in the intake and return airways. The higher temperature registers the air currents as they leave the mine laden with gas and dust, the removal of which keeps the inside sections cool and in a sanitary condition.

The old,disused workings are not open to inspection by anyone,not even a Canon, for nature's forces see to it that all empty spaces in a mine are quickly and completely filled up.

Miners' Houses. — Of the miners' houses we have this to say, from a extensive knowledge of such houses in Canada, the United States and Great Britain; they compare favorably with most in these countries, except perhaps the newer houses at the collieries lately opened up in Britain. We understand that it is Canon Scott's intention to make a full investigation into the housing conditions and we believe that every facility wil be accorded him by the Company to do so Indeed, we are inclined to believe that they welcome an investigation from such a source.

The Reverend gentleman is quoted as stating that the relationship between Capital and Labor should be such that both would get very close together. There are few in Cape Breton who will differ from this sentiment, except where there is no sweet reasonableness on the part of the working men, whose open and avowed purpose was to wreck industry. It is difficult to see how this happy ideal could be realized in the face of the attacks made by labor leaders during the past three years. Now there is some hope.

The Labrador Fiasco. — A number of gold prospectors who went to Stag Bay, Labrador, have returned after a fruitless search for gold. Some of the old timers are very out-spoken as to the gold bearing rocks of the country, or rather the lack of them. A little gold was found by panning in the river, but as one grizzly prospector put it, "There was not enough to crown a tooth". Evidently most of those who went on this barren expedition are disgusted and feel that they have been mislead. *The Canadian Mining Journal* during the winter took special pains to point out that there was not enough knowledge of the district to warrant any expenditure or any large rush of men equipped for gold mining. Everything that was known geologically about the district was published to warn the public against luring advertisements. While there was little to be said in favor of prospecting for gold at Stag Bay, yet we learn that many who occupy the seats of the mighty and whose voices are heard in the councils of the nation were beguiled by the wiles of the stock manipulators and their wild-cat schemes. The Labrador bubble has burst and there are a few more men wiser, though poorer.

Advertisements other than "Employment Wanted" or "Employees Wanted" will be inserted in this department at the rate of 20 cents per agate line (14 agate lines make one inch). $2.80 per inch, each insertion, payable in advance. Space measured from rule to rule. When four or more consecutive insertions of the same advertisement are ordered a discount of 25 per cent. will be allowed.

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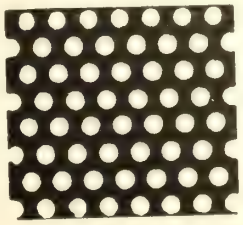

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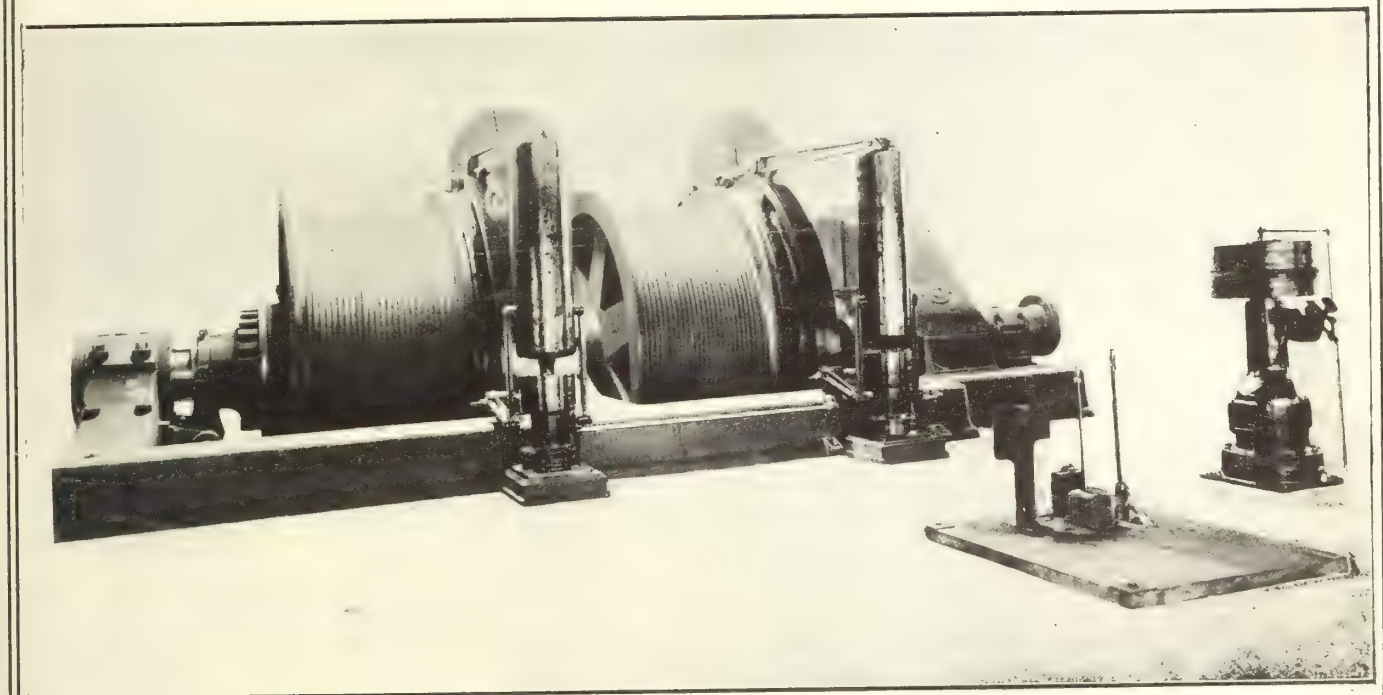

This Hoist hauls a 15 Ton Load on a 45° Slope at 1600 ft. per minute. Drums 107" Dia. by 50" face. 1¾" Rope. Driven by 900 H.P. Motor Through Single Reduction Herringbone Gears. Clutches and Brakes Oil Operated.

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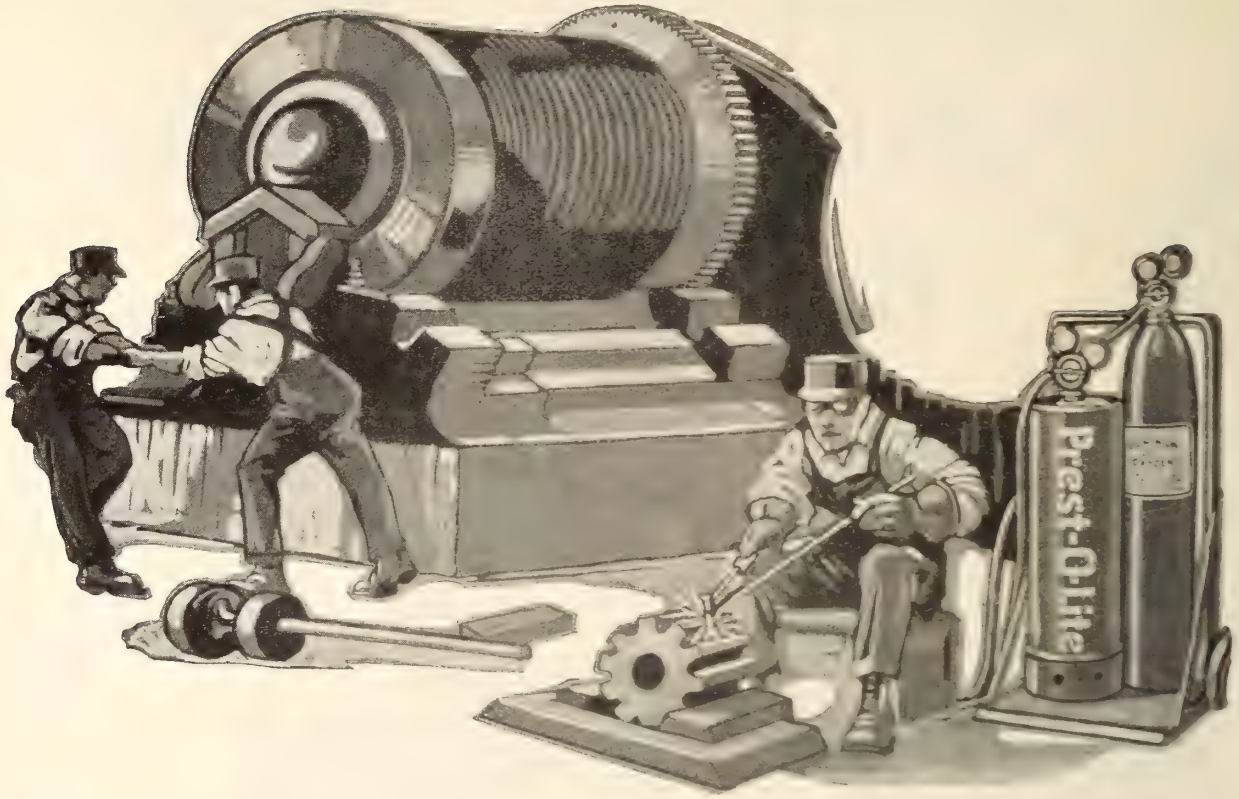

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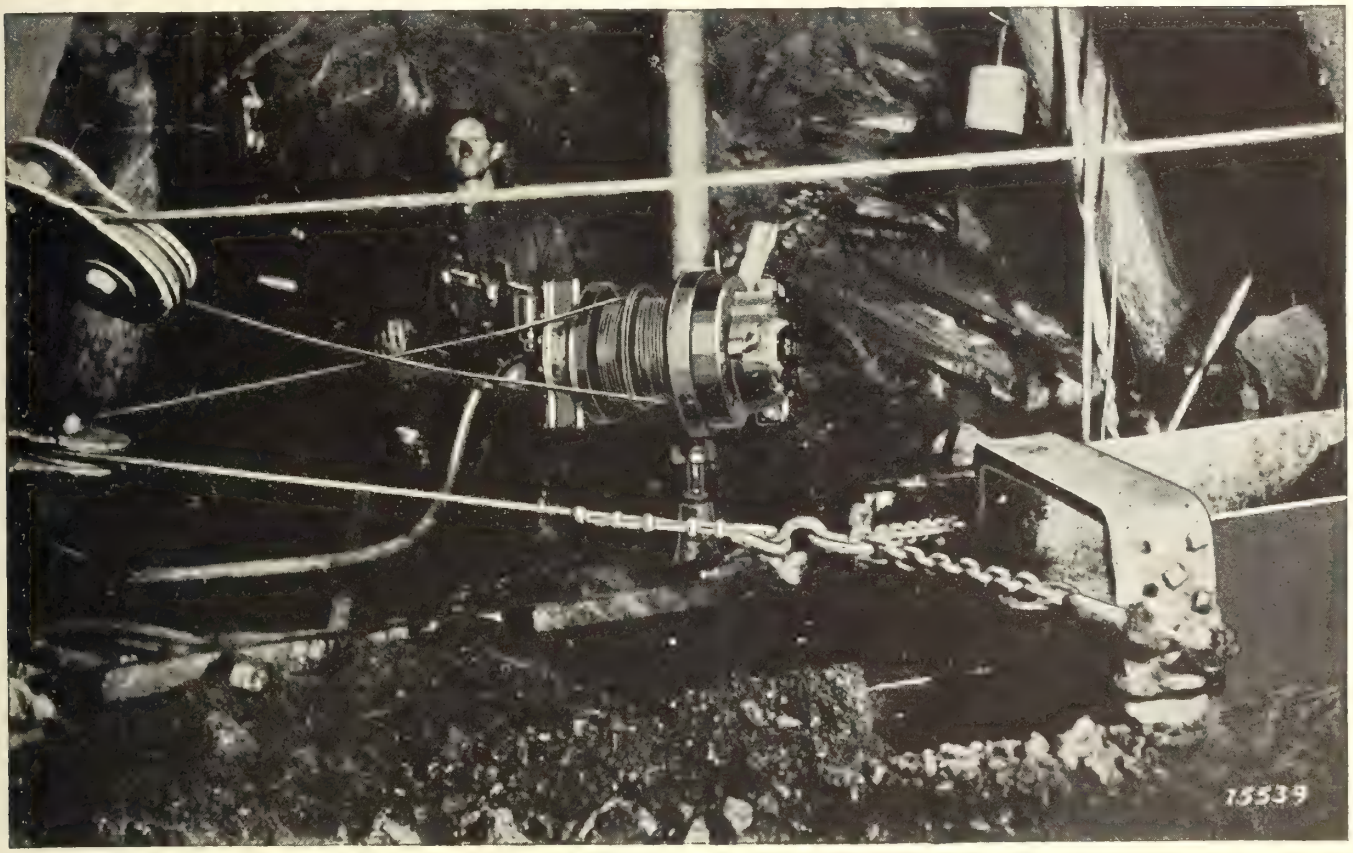

6-H "Little Tugger" Hoist scraping into chute. The hoist has been offset in a niche and the haulage and tail rope are passed through sheaves to get proper direction of haul.

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Economic Minerals

In addition to the above, practically all economic minerals (coal and tin excepted) are found in Ontario: — actinolite, apatite, arsenic, asbestos, cobalt, corundum, feldspar, fluorspar, graphite, gypsum, iron pyrites, lead, mica, molybdenite, natural gas, palladium, petroleum, platinum, quartz, salt, talc and zinc. This Province has the largest deposits on the continent of talc, feldspar, mica and graphite.

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Preliminary returns show the output of the mines and metallurgical works of the Province for the year 1922 to be worth $62,202,169, of which the metallic production was $38,190,711.

The following figures show the growth of Ontario's mineral industry by five-year periods since 1891 when a Bureau of Mines was first established.

Year.	Value.	Year.	Value.
1891	$4,705,672	1911	$41,976,797
1896	5,235,003	1916	65,303,822
1901	11,831,086	1918 (Maximum war output)	80,308,972
1906	22,388,383	1921	48,128,387
	Dividends.		

Dividends and bonuses paid to the end of 1922 amounted to $28,096,699 for gold mining companies, and $86,238,185 for silver mining companies or a total of $114,334,884.

Mining Regulations

A miner's license costs $5.00 per annum, and entitles the holder to stake out in any or every mining division three claims of 40 acres each. After performing 200 days' assessment work on a claim, patent may be obtained from the Crown on payment of $2.50 or $3.00 per acre, depending on location in unsurveyed or surveyed territory.

Assay Office

The Provincial Assays Office at No. 5 Queen's Park, Toronto, is maintained by the Department of Mines for the free identification of minerals, free assays under the provisions of the Mining Act of Ontario, and also for general assay work as per the Schedule of Charges which may be obtained on application.

Temiskaming Testing Laboratories

The Department maintains, at Cobalt, an ore sampling and testing laboratory which is now prepared to receive parcels of gold ore from 100 pounds upward, and after sampling and assaying the same to pay to the shipper the value thereof, less treatment charges. The purpose is to afford a market for ores extracted by prospectors and others in developing their mining claims, enabling them to obtain funds which they can use for further work and to report on the most satisfactory method of treatment. Fuller information may be obtained on application to the Manager, Temiskaming Testing Laboratories, Cobalt, Ontario.

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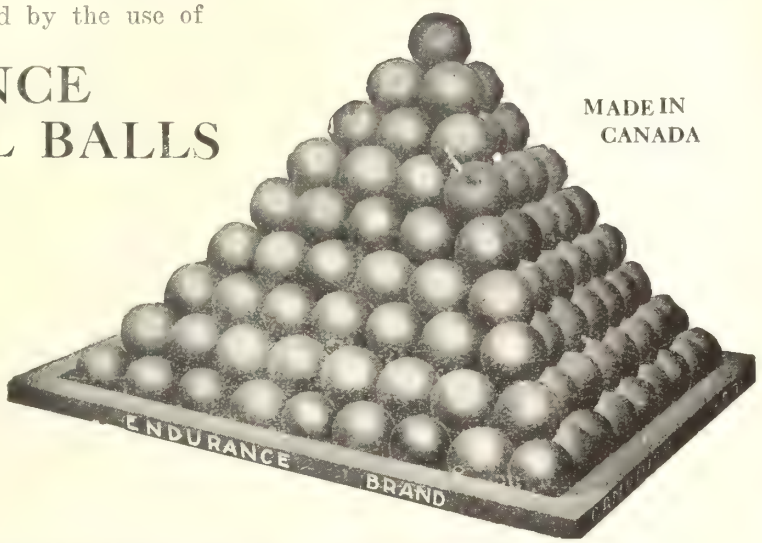

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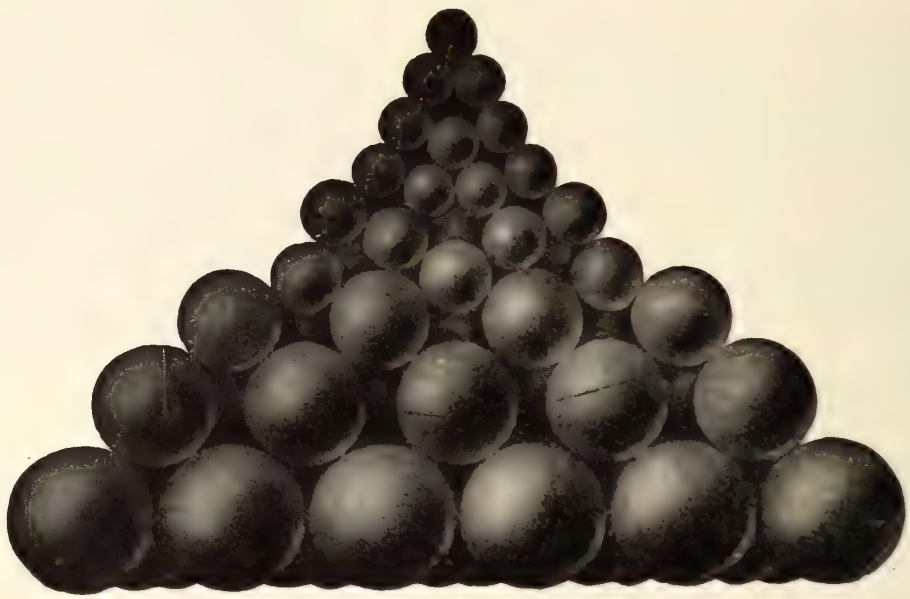

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PUBLISHED WEEKLY

Devoted to the Science and Practice of Mining, Metallurgy and the Allied Industries; and more particularly to their progress in Canada

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IRON AND STEEL PRODUCTION IN THE WEST

A great deal of effort has been exerted by a group of men in British Columbia in an attempt to establish an iron and steel industry on the Pacific Coast. The prime mover in this enterprise is Mr. H. J. Landahl, who has been indefatigable in stirring up interest and has prepared plans for an organization on a large scale.

We understand that the executive of the British Columbia Division of the Canadian Institute of Mining and Metallurgy is watching developments in connection with this proposal. That is as it should be, and it is hoped that in this laudable exercise of its functions the Institute as a whole will avail itself of its opportunity for self-expression. One of its chief claims to existence is that it represents authoritatively the opinion of the Dominion's mining and metallurgical fraternity. Here is a proposal of national importance that requires full public discussion, since public aid has been sought. Numerous members of the Institute are qualified to examine the various phases of the problem and the means proposed by Mr. Landahl to meet the case. Particularly well qualified for such a discussion are those already engaged in the iron and steel business in Ontario and Nova Scotia. Here, then, may lie an opportunity for the Institute to render a distinct and tangible service to our mining industry, by inducing certain of its members to conduct a full and authoritative public discussion of British Columbia's problem.

Meantime we may be permitted to give our opinion on the matter. It appears as though too magnificent and conjectural a superstructure had been built upon foundations that are quite insufficient. There are too many "if's" about the project. We do not say that these queries cannot be answered satisfactorily, but it is the appearance of conjecture, insufficiently supported by fact, that is wrong.

For instance, it is stated that pig-iron can be produced at $20.00 per ton, if coke can be delivered at a cost of $5.00 per ton. Can coke be supplied at this figure? We understand that the estimated cost of local coal operators is nearer $11.00 per ton, and there is still the question of where it is to come from. No coke that would be suitable has yet been produced in British Columbia; but Mr. Landahl hopes to get it from Nicola Valley coal.

Then there is the question of the supply of iron ore. We understand that the main source relied upon by Mr. Landahl is in Mexico, not in British Columbia. Is it reasonable to expect that such ore can be delivered at a rate to compete with the present Canadian and American producers? Reserves of about 30 million tons are cited as being available in British Columbia, notably from the magnetite deposits of Louise Island, Copper River, Porcher Island, Klaanch River and Sechart; but the reports of the provincial Minister of Mines, for which we entertain a whole-hearted respect, certainly do no more than indicate possibilities in connection with these occurrences. There is quite a big "if" here; but it is hoped that the work of Dr. G. A. Young, who is engaged at present in investigating the deposits, will go far towards resolving this hypothesis.

There is also much calculation about the profits to be derived from the manufacture of a multiplicity of steel products. But if the pig iron cannot be produced in the province cheaper than it could be imported, why not talk simply of a steeel manufactory? Could such an industry be established in British Columbia to compete with existing mills that are situated more favorably with regard to markets?

These and other essential points need very careful consideration, the more so in view of the magnitude of the financial proposals. The Imperial, Dominion, and Provincial Governments have been asked to guarantee the bonds of a fifteen million dollar Company, whose common stock would be sold to the public.

It would almost appear that more effort has been expended in the attempt to secure these guarantees than to obtain facts upon which conclusive calculations might be based. However that may be, our own view is that, if the project in its entirety depends upon the proof of these essentials and if such proof may be reasonably demonstrated, it is for individual enterprise to supply this evidence by means of operations on a small scale, to which the multiplication factor could be applied afterwards when the need for it had been shown.

PROFITABLE PROSPECTING

It pays to concentrate.

This is an axiom that applies to prospecting as to other lines of human endeavour. The lesson of intensive prospecting is not easy to learn, but it must be learned if the most is to be made of our mineral areas.

Strange though it may seem, only a comparatively small number of those engaged in prospecting work

are capable of conducting it intensively. The man who travels the water routes and roams through the woods finds it irksome to settle down on five hundred or a thousand acres of promising ground and comb it over until no outcrop remains unexamined. Much more difficult does he find it to confine his attention to a smaller area and trench and cross-trench the overburden in following up a vein or searching for a better one than he has found already. The pertinacity of many true prospectors is tried beyond endurance when it comes to intensive prospecting.

The technically trained mining man's faith and perseverance are, on the other hand, strained and often broken for another reason. By training and experience he has become accustomed to calculating definitely the results he intends to achieve. Day by day he expects to mark his progress towards this end. Even the vicissitudes of underground exploration are relieved by definite progress; the drift advances, round by round, and another shot may put the ore in sight. But exploration on the surface is of necessity more promiscuous and usually has less definite objects. It is a search guided as much by instinct as by reason. It requires a disposition, either natural or acquired, that is not at all common even among mining men, whose professional work is considered by other engineers as "chancey" above all others.

One would have thought that the lesson taught at Cobalt would have been learned once for all. But it is not difficult to persuade one's self that the little prospector's pick or hammer and steel are tools preferable to dull and dreary pick and shovel. Apparently the lesson has to be learned over again in each new mining camp. Of course, when once the camp becomes established, or even when it has drawn the attention of investors who can afford to put on a gang of regular pick-and-shovel men, the problem of intensive prospecting is solved. It is during the period of the original search, while the hope and faith of the prospector are still the mainspring of effort, that the difficulty remains.

Our budget of news today from northwestern Quebec records some instances that confirm our faith in intensive prospecting. A few weeks ago the find at Lake Fortune was made by this means. Last week a new ore zone on the property of Noranda Mines was announced, found in the course of a systematic search on the surface. An adjoining property has been abandoned; we wonder if its surface has been scoured with the same thoroughness with which the original vein was examined. The Stabell property is showing increased and very satisfactory values as a result of diamond-drilling. Will trenching disclose a vein system, as at Hollinger?

Many a mining district has been damned and abandoned for lack of the systematic exploration that commences on the outcrops, progresses through a further stage by the aid of pick and shovel, and is concluded with hammer and steel or the diamond-drill. This fact is filtering slowly through to the consciousness of our mining engineers and mining investors, with the result that these old camps are no longer avoided like plague spots. A large number of them deserve the intensive prospecting we have attempted to discuss above, and none of them have had it. We are confident that when once they become the vogue—an event that is bound to happen—some of these old, disreputable, stock-jobbed, and thoroughly discredited camps will be transformed into new camps that will rank with the best. Then we shall realize more completely than ever that it pays to concentrate.

A BLESSING IN DISGUISE

The anthracite strike that has been threatened so long has come, for how long it is impossible to predict. Its incidence has not, however, caused the consternation that accompanied the strike of last year. Both here and in the United States those accustomed to use anthracite have learned during the past twelve months that there are other domestic fuels available, some of them as good as it, or better, and large amounts of these substitute fuels have been put into the cellars or the dealers sheds.

To those in eastern Canada formerly wholly dependent upon anthracite for a household fuel, the threat of a strike, and now the fulfilment of the threat, is a veritable blessing. If an embargo should be placed upon the export of anthracite to Canada, the blessing may take on a thin disguise, but its real usefulness will be augmented. There are various reasons, which have been set forth in many places during the past twelvemonth, but will bear repetition.

In the first place, we Canadians have now, at last, been at least partly convinced that we should make use of our own fuel resources so far as is economically possible. As a result, coal from Nova Scotia is finding a ready market at St. Lawrence ports, and Manitoba's supply for the year has been drawn mainly from Alberta. Active preparations are under way to provide an additional outlet for these coals as by-product coke for household use, and the carbonizing plant now under construction at Ford, Ontario, may provide for the similar use of non-coking coals. Several thousand tons of Alberta domestic coal are on the way to Ontario under the special $7.00 freight rate, and one operator is reported to have offered his coal in Toronto at $11.50 a ton, including the $9.00 freight charge of Sir Henry Thornton's standing offer.

One opportunity has, so far, escaped us entirely. We have failed to make any progress whatever during the past year in utilizing the vast resources of peat available up and down the eastern provinces. The best efforts of the Joint Peat Committee and their engineer, Mr. E. V. Moore, have apparently been wasted

on us. They have worked out a commercially feasible process for making a good domestic fuel; but our investors are so obsessed by the vision of former failures in the manufacture of peat that they will not put up the money to instal a new commercial plant or to renovate the old one. We hope this strike may induce a change of heart.

The importing of domestic grades of coal from Great Britain has been inaugurated on a moderate scale. As announced last spring by emissaries of British coal operators, screening plants have been provided at the docks and coal of unusually good quality is now available.

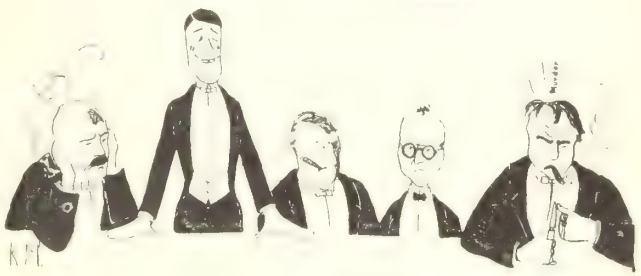
Most important of all, perhaps, is the fact that the threat of a coal famine has induced a large fraction of those dependent on coal for household fuel to fill their bins during the summer months. The constant insistence of the Dominion Fuel Board and the provincial fuel controllers upon this point has had its result, for which they are to be heartily commended. If the habit persists during normal times, it will have a marked effect in giving steady employment to the miners and carriers that provide the fuel, and thereby will make it cheaper.

The experience with new fuels that will be the lot of many Canadians during the coming winter will doubtless open our eyes to one fact that heretofore we have ignored persistently. The anthracite imported from the United States is an inferior fuel, as well as expensive. Its fancied exclusive convenience, too, is an illusion that will be dispelled when once we become accustomed to a really good fuel. Some of the coal now available in Ontario and Quebec from Great Britain and Alberta has twenty per cent. less ash than Pennsylvania anthracite, has a higher calorific value, and costs less, though it is worth more.

Yes — in the long run these anthracite strikes will prove to be an educative influence that will offset much temporary discomfort and dislocation of trade and of personal habits.

A press despatch from Washington states that the Bureau of Mines has announced the successful conclusion of tests with the new type of carbonizer being tried out jointly by American and Canadian technical authorities. Our readers will recollect that the experiments of the Lignite Utilization Board at Bienfait, Saskatchewan, though successful in many particulars, failed through the inadequacy of the essential part, the carbonizer. The simple type now under trial is stated to be thoroughly satisfactory. If extended commercial trials on the lignite at Bienfait should be equally satisfactory, it will open up for general use the most easterly portion of the vast beds of fuel underlying the western plains. The lignite can be mined cheaply by steam-shovel and awaits only a feasible method of driving off the excess of water and combustible gases to make it useful as a fuel of the highest grade. A satisfactory means of briquetting has been evolved already at Bienfait.

It is becoming the vogue for men in high positions to repeat publicly the statement that Canada has vast undiscovered mineral resources. "I believe you have not "even begun to realize the extent of the mineral re- "sources of this country," said Lord Birkenhead, formerly Lord Chancellor in the Lloyd George government, in his address to the Canadian Bar Association in Montreal this week. "I believe the future welfare and "prosperity of this country depend fully as much on "mining as on agriculture, and that is saying a good "deal," said Hon. Chas. Stewart, Minister of Mines at Ottawa, in his address to the American mining engineers last week. So the chorus grows in volume. If we temper our enthusiasm for the mining industry with discretion, this publicity will serve an eminently useful purpose. It is up to us of the mining profession to see that the professional boomsters and financial sharks do not make capital of this enthusiasm.



THE SPEECH

We had stood, without a whimper,
His preliminary simper;
We had smiled a sickly smile at all his jokes;
We had paid polite attention
To each topic he did mention,
While we soothed our weary souls with many smokes.
But we couldn't stand the strain
When he quoted old Mark Twain,—
Hackneyed thing that every novice loves to quote —
And, as always, now and ever,
Blast the bird! He thought it clever,—
Didn't know he made himself a giddy goat!
But if ever once again
Any blighter quotes Mark Twain,
We have made a solemn vow to strike him dead!
And we'll throw him down that shaft
At which other fools have laughed,—
And the bounder's blood will not be on our head!

J. C. M.

PUBLISHERS' ANNOUNCEMENT

The publishers of the *Canadian Mining Journal* have much pleasure in announcing the appointment of Mr. H. G. Nichols as Associate Editor. They have secured his services on behalf of the Canadian mining public particularly with a view to the needs of British Columbia, where Mr. Nichols is conducting his professional work as mining engineer and geologist. They hope by this means to overcome in large part the disability imposed by the twenty-five hundred miles separating the office of publication and the mining districts of British Columbia. The mining industry of Canada, like the Confederation, is one, and through Mr. Nichols' present appointment, the *Canadian Mining Journal*, the mining industry's public representative, hopes to serve it more adequately and more worthily.

MR. H. G. NICHOLS

Mr. Nichols' training and experience make him eminently qualified to represent publicly our mining industry. He is one of the many Associates of the Royal School of Mines whose field of endeavour has become the world at large. His first work after graduating in 1889 was at a gold mine in North Wales; his second, at a coal mine in South Wales. South Africa, and then Swaziland, next claimed his attention. In 1897 he came first to British Columbia, where he had a varied experience in the metal mines. For an interval California, Honduras and London were successively the scene of his labours. In 1907 he returned to British Columbia to direct work at the Ymir Gold Mines, which he managed until operations ceased in 1910.

Metallurgical research next occupied Mr. Nichols in London, whence he returned to South Africa to instal a plant at the Robinson mine. A visit to the placers of the Lena district in Siberia was followed by further research work on Cornish tin ore.

The war found Mr. Nichols with Messrs. Bainbridge, Seymour & Company, whose activities had taken him to Burma, the United States, Spain and other parts of the world. He enlisted and served until demobilized in 1919. After one year in Mexico he returned to British Columbia, where it seems possible his old friends, aided by the natural attractions of the province, may induce him to settle permanently.

In addition to activities of the purely professional variety, Mr. Nichols has occupied himself during the past four years with public questions affecting the mining industry of British Columbia and of the Dominion. He is one of the leading spirits among the Western members of the Canadian Institute of Mining and Metallurgy. The Mining Association of British Columbia also has had the benefit of his vigorous support. Now that the *Canadian Mining Journal* is so fortunate as to claim part of his attention, the Canadian mining public will benefit still further from the sound judgment that has resulted from his world-wide experience and from the clear-sighted idealism that has been his guide through all his travels.

GOLD MINES IN FRANCE

One seldom hears of gold mines in France, yet there are several of them, which are described briefly in the current issue of *Mines, Carrière, Grandes Entreprises*. At Lucette in Mayenne two quartz veins in schist and quartzite of Silurian age contain stibnite, mispickel and gold. At La Belliere in Maine-et-Loire veins of auriferous mispickel occur in pre-Cambrian rocks, and the gold is recovered by amalgamation and cyaniding, and a concentrate is made from which arsenic is recovered. At Le Chatelet auriferous mispickel occurs in quartz associated with pegmatite, yielding both gold and arsenic. There are half a dozen gold mines in addition, most of them discovered and operated during the last two decades. The average gold content of the ore is approximately the same as that in the Transvaal, but all the mines are small.

SYNTHETIC AMMONIUM NITRATE

When Germany was blockaded early in the war and could no longer draw her supply of nitrate from Chile, her chemists at once applied the results of scientific research conducted previously to the establishment of works to make synthetically from air and water the much used explosive, ammonium nitrate. There is now under construction at Billingham on the east coast of England the first British factory for the manufacture of ammonium nitrate by this process. Brunner, Mond & Co. are the builders.

J. C. M. of the C. M. J.

By ALEX. SMART, B.A. (Oxol.), B.Sc., (Bovril)

Some of the great poets have been victims of most extraordinary non-recognition of genius. No less a one than Wordsworth wrote volume after volume of poetry and at first met with ridicule and execration. Have the readers of the C. M. J. been as keenly appreciative of J. C. M.—whoever he may be—as they might? True, no ridicule has been heaped upon him nor has execration been his lot. On the other hand no one has, as yet, seen fit to give his verse the praise it deserves. I thought of doing so myself, but there are those from whom praise is not acceptable, partly because of their inability to judge and partly because of their inability to appreciate and distinguish real worth.

Fearful lest my opinion would not carry sufficient weight and lest my criticism would reveal the student lacking in literary attainments, I submitted J. C. M.'s *pièces de résistance* to world-wide recognized critics. Their very names signify their qualifications and their ability to speak with authority and to voice opinions that readers of the C. M. J. will follow with interest.

I have not hesitated to gather some visions in Paradise. In comparison with the mundane opinions, the work of the great poet J. C. M. may be said to have caused as great a flutter in realms heavenly as in those terrestrial. The comments of the critics are given in their exact words. Here is what they have to say:

JOHN STUART MILL—"I sure do like J. C. M's poetry. Our initials are very similar. His poetry teaches me to increase my interest in the common feelings and the common destiny of human beings. But kiddo, say, these lines sound like Wordsworth's:

'Precocious child! so lavishly endowed
With mental growth to others not allowed!' "

STEPHEN LEACOCK—"J. C. M. (whoever he is) is not destined to become extinct like most poets. Far be it from me to accelerate his extinction. I appreciate the sympathetic yet economic turn in the lines

'My first instinct was to dip
Into my pocket for a tip.'

Editors will readily countenance his poetry."

(Note—It was a mere coincidence that the two great economists were interviewed one after the other.)

WILLIAM WORDSWORTH—"There is something in the madness of J. C. M. that interests me more than the sanity of Lord Byron or Sir Walter Scott. His is the simple product of the eight-hour day. Like myself, J. C. M. is a great poet. I never turned better lines than these:

"Let us with a cheerful mind
Cherish hopes when so inclined:
Disregard the croaking gent
Who insists the world's hell bent.' "

PERCY BYSSHE SHELLEY——" 'Ethereal' best expresses the quality of J. C. M's genius. How I would like to know his name! His poetry is full of dynamic effects. Read, re-read and let me add, read again those dainty lines:

'He wouldn't use crimpers; he used his teeth,
Now the flowers are above and he's underneath.'

His poems are like the waterfalls of Niagara which, tumbling from a height of thousands of feet, are shattered into foam by the air and waved about over the valley. Very beautiful is the descending spray; the rainbow dwells in its bosom; but there is no longer any stream, nothing but an irridescent mist. Wonderful! Wonderful!"

(Note—Mr. Shelley was a trifle out on his measurement of Niagara, but we were glad to have his opinion notwithstanding its length).

LORD MacAULAY—"I abhor *noms de plume*. This J. C. M. has an endless wilderness of twaddle, but he has some fine discriptions. Imagine, though, a poet mistaking a college educated man for a tramp .....Perfectly ridiculous!"

(Note—the essayist-historian was decidedly grouchy when interviewed. However, we can say that his tastes and habits of mind make him a poor judge of a poet such as J. C. M.)

LORD BEAVERBOARD—"In J. C. M. the C. M. J. has a poet whose forcefulness ought to bind the serious and humorous interests of the mining industry. Like my A. B. B., he has a great future before him. To think of a young country producing us three in a generation!—Remarkable! But, why the disguise? Think of all that 'The Gentleman with the Duster' is missing!"

(Note—Another remarkable coincidence that we should interview two noble lords one after the other).

JOHN RUSKIN—"Your J. C. M. displays the majesty of simple feelings. With high reflective truths he analyzes the ways of men. A greater poet than your Robert Service, he reaches the essentials. I like his, 'as if to paint the lily too.' It combines a word and action of my own thoughts."

THOMAS CARLYLE—"I have a real respect for the antique greatness of his devotion to the mining industry. Sometimes I find his saintly reflections—'St. Simeon Sytlites' and possibly 'Didymus and Aquinas'—unfathomable. But, the dignity of labour suffers not—not even in such lines as

'His jaws were working on a chew.' "

SAMUEL JOHNSON—"Some poet, believe me! This J. C. M. abounds with images, which find a mirror in every mining mind, and with sentiments to which every mining bosom returns a echo. Now, J. C. M.'s lines remind me somewhat of that northern savage, Robert Burns, whose 'Cottar's Saturday Night' was good verse for a Scot:

'Your grouch evaporated while you stood
With outstretched hands and eagerly did wait
The heaped-up riches of your breakfast plate.' "

HOMER— (Note—Not the one who smote his blooming lyre to accompany, "Yes, we have no bananas today.")

" 'Tis a wise poet that dodges dactylic hexameter in English, though it is delicious in Greek. I like his 'heartless dawn,' in comparison with my 'rosy-fingered morn.' But, of all his lines, this:

'Lo! at his fire the heaven-sent cook performs,'—

is worthy of a place among the classical gems.

PUBLIUS VERGILIUS MARO — "This person J. C. M. is too modest. Remember you not that some unscrupulous fellow thought it safe to claim my verses as his own? Have this J. C. M.—whoever he may be—write his name in full so that more than the world of letters may have his full name. And then, more's the

honor to him (*laudite jam rivos,* or as your Bliss Carman might say, 'That ought to hold him for a while.' ")

JOHN DRESSER—"While it seems that he 'just can't mention his name,' I, as president of the C. I. M. M. wish to express my appreciation of J. C. M.'s output. Scanning his strikes, sampling his verse along the shear zones, examining his stanzas horizon by horizon, and tracing out every contact, I have concluded that J. C. M's poetry should not be 'just casually meditated' upon but should be given serious consideration—all excepting one poem."

Having interviewed all these famous critics I felt that, as Wordsworth had been frequently consulted about his own poetry and had just as frequently expressed his perfect satisfaction with his own efforts, it would only be fair to the anonymous J. C. M. to interview the great Canadian poet, with the object of obtaining his own opinion of his own verse. I asked for his views in prose, but once again the poet got the better of him and he quoted:

"The moving accident is not my trade,
To freeze the blood I have no ready arts;
'Tis my delight in summer's shade
To pipe a simple song for thinking hearts."

Now I call that modest; but nevertheless, I regret that I am unable to give to the readers of the C. M. J. the great poet's name.

The great ones of all time have appreciated J. C. M., and it is up to us, "the people of distinction in society" (i. e. those connected with the mining industry) to see that the appreciation of J. C. M.'s genius is continued. Let us not forget that his is a poet's pen which

".....gives to airy nothings
A local habitation and a name."

VIVE J. C. M. OF THE C. M. J!

(P. S.—I understand that it is customary when writing articles for technical journals to send a photo to let the reading public know whether the writer is well thatched or bald. The writer is somewhat sensitive of approaching baldness, so refrains.)

LETTERS FROM READERS

The Asbestos Industry of the Province of Quebec

To the Editor,
Canadian Mining Journal.

Sir:—This letter is inspired by, and most emphatically refutes, the two articles by Mr. G. E. Booker, published in the *Canadian Mining Journal* on July 6 and July 20.

The Asbestos Industry of the Province of Quebec is in the best possible hands. The engineers employed, both as consultants and operatives, are of the highest type. Their remuneration probably averages higher than in any other mining camp in the Dominion. They have their reputations to uphold and if they were not considered competent would cease to be employed. Their employers have invested some thirty million dollars in this area. They are careful that this investment is adequately protected by selecting, on the best advice obtainable, thoroughly competent and reliable men to fill Executive, Managerial and Operative posts.

Turning to the earliest records in the writer's possession we find that in 1903 the sales of Mill Fibre exceeded the sales of Crude in both value and tonnage, and undoubtedly this condition existed for several years before this date. The Mill Fibre business has developed greatly in the past 25 years, but it must be realised that this development was keeping pace with the requirements of the manufacturer. No great corresponding increase in the production of Crude was possible. The same rock from which Crude alone was extracted was milled to recover fibre, and it was only milled to the point where it was possible to pay for the cost of milling by the increased value of extracted fibre.

Market conditions govern the percentage of recovery of Fibre in any mill. The Asbestos "dust" which Mr. Booker claims is wasted costs more to produce than it will fetch. The demand for such material is far less than the potential supply, and is judiciously kept level by the Mine Operators, who cannot see the wisdom of selling more material than they can help at prices below cost of production.

Mr. Booker claims that from 25 per cent. to 30 per cent. of the possible extraction is wasted. This statement is probably quite correct. He says, however, that 25 per cent. of the total mill rock yields no return. An error here; he meant, doubtless, that 100 per cent of the mill rock yielded 75 per cent of its fibre content. This 75 per cent return is saleable, and will return a profit. The cost of producing the other 25 per cent. is so high that it is impossible to market it to advantage.

It is quite wrong to assume that the possible production in 1922 and the actual production in the same year varied directly in tons and value. Mr. Booker estimates about 44,000 tons, having a value of about $1,730,000, could have been produced without further cost. As a matter of fact, this 44,000 tons could not be worth more than $8.00 per ton, or $352,000.

Admitting that $352,000 is a considerable amount of money to throw on the dumps, let us realize that against this sum are the costs of the further milling and collecting of this material, the bag cost, bagging cost, loading, teaming, and warehousing, and the overhead expense of the enlargements to storage sheds made necessary by the increased tonnage. Other factors, not quite so noticeable, enter. Extra superintendence is essential; also testing and inspection of shipments would create losses in time and money.

Dust chamber material is saleable in small quantities. It is only saleable when reasonably free from rock and grit. The market is limited and the prices obtained do not warrant its collection, but local legislation compels the mills to collect it. The dust that covers floors, rafters, etc., in the mills themselves contains such a quantity of finely ground rock particles as to be unsaleable.

Undoubtedly reinforced concrete construction is preferable to wood. Unfortunately the existing milling methods have not undergone any sufficiently radical change in the past twenty years to warrant scrapping the present mills, and their replacement with steel and concrete or similar construction. The cost would be so great as to render it impossible for the mine owner to receive sufficiently increased value to cover the interest on the outlay.

It has yet to be proven that any other type of mill will do the work as effectively and cheaply as those now in use. Some of the most rickety, patched-up mills in the district do as good work as the best constructed.

Regarding mill practice, Mr. Booker assumes that two crushings are sufficient. As a matter of fact, less than one-fifth of the tonnage of fibre now produced could be recovered in a lay-out of this type. A secondary crusher cannot be calculated to reduce 4" material to a sand.

The writer knows of no case where the fibre rests periodically in its transit through the mill. It travels at a uniform rate from the mill bin to the bagging pile, stopping there only for inspection and testing.

It is to be regretted that a publication of the standing

of the *Canadian Mining Journal* should see fit to publish a paper containing such hopeless inaccuracies, making charges of inefficiency and waste against men who have devoted years to the establishment of the asbestos industry, particularly when these charges are laid by one who positively cannot have either experience in, or any knowl edge of mining, milling or marketing asbestos. His own words convict him.

Montreal, Que. Samuel Davis.

PERSONAL AND GENERAL

Mr. George L. Burland has returned to the asbestos district of Quebec, to engage in an investigation of a wet method for treating asbestos. During the past three years a considerable amount of research into this treatment in water was conducted at the Vimy Ridge property of the Bennett-Martin company. The work is being con tinued now in Thetford.

Col. John A. McDonald has been appointed superintendent of the electrical department of the steel plant at Sydney, Nova Scotia. He succeeds Mr. C. C. Boucher, who has resigned to accepted a position in Chicago.

Mr. John A. Dresser, President of the Canadian Institute of Mining and Metallurgy, accompanied the excursion of the S. I. M. M. E. throughout the tour of Ontario and Quebec. He fulfilled with his usual grace and vivacity the function of official host on behalf of the Institute.

Canon Scott has returned to Quebec after a two weeks' tour of inspection of the steel plant and collieries at Sydney, Nova Scotia.

Dr. Alan M. Bateman, of Yale and Dr. E. S. Moore, of the University of Toronto, have been recent visitors to the Portland Canal mining district, and it is reported that Dr. Lindgren, of the Massachusetts Institute of Technology, proposes visiting the same camps before the summer season closes.

Dr. Malcolm MacLaren, geologist of London, has been making a study of the mineralization of the Premier Mine and of the general geology of the Portland Canal Mining Division.

Mr. F. S. Lewis, senior partner of the firm, Sidney Lovell & Co., London, accompanied by Mr. H. C. Beaven, who is associated with the same firm, has completed a tour of the newly opened up mining camps in the northwest of British Columbia. They were particularly in terested in learning at first hand the prospects of the M. C. and Prince John Groups of mineral claims, as both these properties have been introduced to the London market.

Dr. Charles Camsell has sailed for England to advise Hon. Charles Stewart, Minister of Mines at Ottawa, on matters pertaining to the mineral industry during the coming Economic Conference.

Mr. M. C. Keith, of New York, accompanied by Mr. H. A. Guess, managing director of the Premier Gold Mining Co., and Mr. H. B. Price, mining engineer, is visiting British Columbia with the purpose of visiting the different mining properties of interest in the northwest. It was suggested that he would pay special attention to the Big Missouri Group in the Portland Canal district, which now is under development by Messrs. Trites, Wood, and Wilson.

Mr. H. S. Denny has passed through Montreal on his way back to London. Mr. R. B. Lamb, who was with him on his recent visit to the Portland Canal district of British Columbia, has returned to the east also.

Dr. Alfred Whitman of the University of California has made an examination of the Castle-Tretheway mine in Gowganda.

Mr. Cyril W. Knight left the employ of the Ontario Department of Mines at the end of last week to join the staff of Nipissing Mines. The first part of his report on the silver areas to be published is the section dealing with South Lorrain. This was issued as Bulletin No. 48, on the occasion of the visit to South Lorrain of the visiting American mining engineers.

Messrs, Fraser D. Reid, J. J. Denny and R. H. Hutchison, of Cobalt, added materially to the facilities of the A. I. M. M. E. excursion also. Their record of the metallurgical practice of the camp, published as Bulletin No. 47, was put in the hands of the excursionists in Toronto.

Colonel Rowland C. Fielding, consulting engineer for the Porcupine-Davidson Gold Mines, is in Northern Ontario on a tour of inspection on behalf of a British syndicate. Col. Fielding is a mining engineer by profession and has had a world-wide mining experience; but he has managed to sandwich in a good deal of military experience. During the recent war he served with distinction in the Coldstream Guards, with which regiment numerous members of his distinguished family have long been associated.

Mr. Robert Wallace, who for thirty years has been connected with the International Nickel Company as metallurgist at Bayonne and Huntington, has retired from active service. He has been to a large extent responsible for the remarkable metallurgical results obtained by the Company, commencing at the time when "nickel" spelt "old Nick" to the copper refiners at Bayonne. He remains with the Company in a consulting and advisory capacity.

MINING STANDARDIZATION

The American Mining Congress will hold a National Standardization Conference, under the auspices of its Standardi ation Division, in Milwaukee on September 26th to 28th. The mechanisms and materials used in mine; and mills, as well as methods used, will be discussed. There will be addresses by prominent speakers; but the principal concern of the meeting will be the discussion of reports on standardization submitted by various sub-committees. The object of this standardization effort is epitomised as "the elimination of waste in the mining industry; the simplifi cation of mining methods, practice and equipment; efficiency in operation."

RADIO EXHIBIT AT CHEMICAL EXPOSITION

How the radio is finding a use for many of the rare metals will be shown at the composite radio exhibit at the Chemical Exposition which opens at the Grand Central Palace, New York, on September 17th. A number of well-known firms have contributed products of their manufacture which deal directly or indirectly with the construction or operation of the radio. Thorium, tellurium, selenium, tantalum, molydenum, — all of these metals rarely getting into commerce on a broad scale, will be demonstrated. In addition to the metals, carborundum crystals, synthetic resins, hard rubber radio parts, extremely fine precision instruments for electrical work and a number of other important features of the radio constructions, will be demonstrated. Alundum tubes for use in measuring high temperatures, particularly in furnaces for drawing tungsten tube wire, will also form part of the exhibit.

The MacKenzie Report on Southern Vancouver Island Coal Reserves

By C. M. CAMPBELL*

It is necessary in the interests of national economy that the amount of coal available for present and future use be ascertained with some precision.—J. D. MacKenzie.

The Geological Survey, on June 1st last, published the report of the late J. D. MacKenzie dealing with the coal resources in the southern part of Vancouver Island. Mr MacKenzie announced his conclusions last fall; his report has now been published for some time; it deals with an extremely important matter, yet it has been ignored not only by the public but also by the technical press.

The industrial supremacy of the countries about the North Atlantic is a large measure due to their possession, at or near tide-water, of large deposits of coal. There are no deposits of coal of real importance along the American North Pacific. Coal is found in Washington State, but it is limited in tonnage and costly to prepare. Coals from the interior are subject to a $4 to $6 per ton freight handicap. In Canada the same is the case in regard to Alberta coal. It would therefore appear that the coal on Vancouver Island, where it outcrops along the protected side of the Island, where climatic conditions are very favorable and where there is a large tributary population, should give that Island a great advantage in industrial matters. Vancouver Island coal has undoubtedly been of great importance to British Columbia in the past and will continue to be of great importance for some time longer. Why it is not likely to be of the supreme importance that previous official articles would indicate, is dealt with in the MacKenzie report.

Former Surveys

It appears that coal was known to the Indians in the early days and that Dr. W. F. Tolmie, in 1835, was the first to make its existence known publicly. Coal was located at Namaimo in 1850 and mining was started in 1852. Until 1861 operations were in the hands of the Hudson's Bay Company and the market was in San Francisco, where coal sold at $28 per ton. Since then mining has been carried on by different companies continuously and the present output from Island mines amounts to 1,700,000 tons per year.

The Geological Survey did some of its first work in British Columbia on the Island. James Richardson began in 1871 an investigation of the coal measures that lasted, with interruptions, for 5 years. He examined the coast line from the head of Comox harbor to Victoria. In this area he found that a series of rocks, 100 miles in length and extending from Brown River to the Saanich peninsula, contained coal seams of various thicknesses at different points. The conclusion was then made that these seams were continuous throughout the greater part of the area and this area was therefore represented on his map as "Productive Coal Measures." Under the circumstances it was easy to believe nearly anything in regard to the unlimited nature of the coal reserves of Vancouver Island. Richardson is praised for the patience and persistency with which he carried on his work. Exception, however, is taken, to his conclusion.

Richardson's area has, for convenience, been subdivided into the Comox, Nanaimo, Gulf Islands and Cowichan areas and his report was followed in 1913 by a detailed and interesting report by Clapp dealing particularly with the Nanaimo area. Clapp also did some work in the Cowichan area. Mr. MacKenzie's report also mentions the Alberni area, but as its possibilities are very slight it will not be further referred to.

Former Tonnage Estimates Excessive

According to Mr. MacKenzie's narrative, "Clapp includes coal seams of the thickness of 1 foot or over to a depth of 4,000 ft., and arrives at a conservative estimate of 1,340,000,000 long tons." This means, according to a popular method of interpreting these figures to the public, roughly 1,000 times the present total annual production. Mr. MacKenzie's comment is that "Clapp's estimate of a very large tonnage for a relatively small part of this area has further strengthened the belief in the enormous coal reserves of the Island."

Both Richardson and Clapp arrived at their conclusions mainly by induction. This is the method employed in Canada by our Men of Vision in arriving at their facts. These are the men who possess that quality known as "Unconquerable Canadian Optimism." Anybody not blindly following this method is branded as a Pessimist, a sort of an Outcast, and is about as welcome in Canadian mining life as was Mr. Blotton in the enlightened circle of the Pickwick Club.

Mr. MacKenzie, unfortunately for his reputation, chose to follow the methods adopted by that "ill-conditioned and presumptuous" Blotton. He was not satisfied with the beautiful sets of figures used by the Orthodox, and, as the different areas have been well opened up for years, he insisted on going below, investigating records of drill holes and interviewing mine officials. In particular he acknowledges the influence of Mr. Thomas Graham, ex-Chief Inspector of Mines for British Columbia and now General Superintendent of the Canadian Collieries (Dunsmuir) Ltd.

Limits of Economical Mining

He found that it is not at present practicable to mine seams of less than 3 feet in thickness. In this connection a recent investigation by the writer may be worth recording. It is to the effect that seams 1 ft. thick do not appear to be mined anywhere. In England seams as thin as about 15 inches have been mined and seams 1 ft. thick might be mined, providing the coal is of first class lump grade, breaks away easily and has a fire-clay floor which can be used as a by-product and in which an undercut can be made cheaply. None of these conditions exist on the Island and, incidentally, they exist in very few other places.

It was also found that 2,000 ft. was about the greatest depth in this area to which mining can now be prosecuted economically. Many other handicaps were also noticed and to quote from the report we find that "the coal in the ground and the coal that a mine may be reasonably expected to produce are not the same. There are always losses, sometimes considerable losses, incidental to mining. A certain amount of coal is left in pillars that are too thin to remove, or that have been crushed by later movements of the strata after the surrounding coal was extracted. Every coal miner on Vancouver Island is only too familiar with the 'rolls' and 'pinches' that make the extraction of coal from certain areas of the mines impracticable, if indeed the movements of the over

* General Manager, Cassidy Colliery, B. C.

lying rocks have left any coal in these thin places. Some areas are so broken by faults that economical extraction is impossible. In one district knobs of the underlying, barren, pre-Cretaceous rocks project through certain parts of the seam. These knobs not only form areas of no value in themselves, but by their effect on the seam as it approaches these old shore-lines interfere with the placing of haulage roads and ventilation. Considerable areas of coal may be lost by mine fires, by excessive gas, water, or by other causes. It is no exaggeration to state that, over considerable areas of some Vancouver island mines, barely 50 per cent. of the coal actually in the ground has been extracted, because of conditions quite beyond the control of the operators."

Mackenzie's Estimates

Further on in the report he also says: "Of the coal mined no insignificant percentage is lost in preparation for the market and in marketing. This extraction factor varies in the different areas, and even between different mines in the same area, so that it cannot be applied readily in a general estimate such as the present one. It is of most vital importance to the coal operator, however, and should be kept in mind by these interested in our future available coal reserves."

We are now in a position to consider what tonnage Mr. MacKenzie found as a result of his investigations. He claims that in the Nanaimo area the amount of "actual" coal, 3 ft. or more thick, and less than 2,000 ft deep, is limited to only 34,070,000 tons. After an extraction factor is applied it will be seen that the assured life to the mines is extremely limited. The corresponding figure for "probable" coal he places at 67,220,000 tons. In order to make a comparison with Clapp's figure he also includes thin and deep coal and every other possibility and yet all this only makes a total of 286,934,000 tons or 21 per cent. of the total given by Clapp.

His findings for the other districts are even more sensational. The big total given in "The Coal Resources of the World" for the Comox district, which is mainly "possible" coal, he finds to be 600 per cent. too large. This district has only 18,900,000 tons of "actual" coal and 39,000,000 tons of "probable" coal. Its "possible" coal above 2,000 ft. depth and over 3 ft. thick amounts to 245,230,000 tons.

The possibilities of coal in the Gulf Islands and Cowichan areas have also been studied in detail. For the former he considers it so improbable that workable coal areas will be found that no estimate for their content is made. For the latter he concludes that it "is not considered a possible source of commercial coal." In regard to the Cowichan area it does not seem clear why it ever was included in the "productive" class. Richardson himself says that "the evidence does not favor the probability of the existence of workable seams of coal in this area." This conclusion was later agreed to by Clapp.

True Estimates of Coal Reserves Required

There has been a great deal of what Mr. Blotton would call "humbug" written in regard to our coal reserves. Not only do our Eminent Authorities add up "actual," "probable" and "possible" estimates as prepared by the Survey and announce to the public that the total represents our coal reserves but, if Mr. MacKenzie's figures are correct, it is evident that some of our own geologists have, at times, announced conclusions that were very wide of the mark. The publication of the MacKenzie report is evidence of a laudable desire to correct errors as soon as they are apparent.

The quotation at the head of this article outlines a new procedure inasmuch as it calls for the recognition of the factors of availability and precision in any coal estimate. What is the object of telling the public that we have certain huge tonnages and suppressing the fact that only a very limited percentage of these tonnages can be recovered? There is also no occasion for haste in regard to the estimation of our ultimate coal reserves. Until we are sure that an area is going to be "productive" it should not be so designated. It is not going to hurt us to leave some resources for coming generations to find. We are leaving them enough debts; let us refrain from including a false statement of our assets.

This heavy reduction in the estimates of our coal reserves at a point where they would be of great advantage, is a big disappointment. The difference between the figures is so great that one naturally asks if it is possible that similar correction will have to be applied to the published reserves of other fields. The advisability of checking up other figures has, however, doubtless occurred to the officials of the Geological Survey.

THE USE OF OXIDISERS IN THE CYANIDE TREATMENT OF CONCENTRATES*

By H. RUSDEN and J. HENDERSON.

Black sand and miscellaneous concentrates (resulting mostly from the clean-up of old reduction works sites) are amongst the by-products received at the Witwatersrand Co-operative Smelting Works. Clean current black sand usually yields a reasonably satisfactory extraction, but frequently fouls the cyanide solutions, charging them heavily with reducing matter. Miscellaneous concentrates are mostly of a much more refractory character, and consignments received from the same source vary considerably from the gold extraction standpoint in the cyanide plant. This irregularity makes it necessary to conduct a preliminary experimental extraction test on all lots of material that may be suitable for cyanide treatment.

The Supervisors of the Smelting Works suggested the use of oxidisers might be beneficial and that a trial be made first on an experimental basis. After making a standard preliminary test with mercury, lime and cyanide, additional experimental trials were made with various oxidisers, which were added after amalgamation and just before the addition of the cyanide.

Permanganate

Permanganate of potash was first tried. A black sand which had shown, experimentally, a very poor yield, giving a residue containing 33.0 dwts. gold and an extraction of 89 per cent. was chosen. Permanganate, nearly equal to the amount required to oxidise the reducing matter (equivalent to 4.4 lbs. per ton of dry material) was added after amalgamation, but before the addition of cyanide. The bottle was well shaken and then the cyanide added. The test was conducted in the usual way and the residue assayed only 3.0 dwts., giving an extraction of 99 per cent. This was quite a startling result, and on being brought to the notice of the supervisors, instructions were given to make further experiments with permanganate of potash, lead peroxide and barium peroxide. The results may be summarised as follows:—

All three gave generally improved extraction; permanganate sometimes slightly increased cyanide consumption, lead peroxide invariably increased cyanide consumption, but barium peroxide usually decreased cyanide consumption. All three at times gave disappointing results. It is to be hoped that discussion may throw some light on the possible reason why the results obtained when using oxi-

* Abstracted from the Journal of the Chemical, Metallurgical and Mining Society of South Africa, June, 1923.

disers at times yield a worse extraction than when no oxidiser is added.

Barium Peroxide

Barium peroxide on the whole gave more consistent results than permanganate or lead peroxide, and instructions were given to make all further experiments using barium peroxide only.

Experiments with varying proportions of barium peroxide were tried, from 1 per cent. of dry weight of concentrate to 0.5 per cent. These experiments showed that, on the whole, 0.75 per cent. gave satisfactory results and was therefore adopted for all further experiments.

The next step was a practical trial. A charge of 10 tons was made up of various lots which had experimentally showed a good extraction with the aid of barium peroxide. This charge was milled and two hundred pounds of barium peroxide were spread over the settled charge in the collector, just before being transferred to the "Brown" tank for agitation. Cyanide was then added and agitation carried on in the usual way. The results showed a recovery of 93.7 to 97.7 per cent. of the gold. Generally speaking, the practical trials agree very closely with the experimental, and must be considered satisfactory when it is noted that in the experimental trials a clean cyanide solution is used, but in the practical, a Works solution that contains a considerable quantity of reducing matter. We cannot say that barium peroxide can be used always with success with any concentrate. From November, 1922, to April, 1923, we have tried experimentally 68 consignments of concentrates with barium peroxide, with the following results:—

Samples giving a satisfactorily increased extraction, 33, or 48.5 per cent.

Samples giving increased extraction, but not sufficient to warrant practical trial, 20, or 29.4 per cent.

Samples giving a worse result than without the oxidiser 15 or 22.1 per cent.

Those giving satisfactorily increased extraction were made up into charges and treated in the cyanide plant with barium peroxide, with good results. The others were treated by furnace methods (pan furnace or sinter pots, with subsequent treating in the blast furnace).

Method of Treatment with Barium Peroxide

We have adopted the following method of procedure in dealing with material that may be treated in the cyanide plant: Any sample, which on the experimental test gives a poor extraction without barium peroxide, and which in other respects is a desirable material for the cyanide plant, is put through a second experimental trial using 0.75 per cent. barium peroxide. If the result is satisfactory that particular consignment is reserved until sufficient material which has been proved to be satisfactory with the oxidiser has accumulated to make up a full charge of 10 tons.

Formerly, roasting concentrates was resorted to when experiment showed that improved extraction was obtained thereby; but it is much easier and less expensive here to use barium peroxide; in fact, our roasting furnace has been dismantled. One undoubted advantage of barium peroxide is that any which enters the solution, precipitates soluble sulphates without adding to the solution any further soluble salt.

The Use of Permanganate

With regard to the permanganate test for reducing matter; we find it a useful guide in the cyanide works as to the degree of "fouling" of the solutions which we may expect, and bleaching powder is added accordingly except when barium peroxide is used. Another interesting point is that the addition up to as much as 1 per cent. oxidiser to most of the samples experimented on did not affect materially the reducing matter present as determined by the permanganate test.

One particular black sand always gives us in the experimental extraction tests a reducing matter figure three times the average of the other black sands. It also consumes more cyanide and lime than the average. But the extraction is generally satisfactory. A charge of this material in the cyanide plant gave the following results in oxygen present in the solution after agitation (we sample our "Brown" tanks just at the end of agitation):—

After first 12 hours' agitation, dissolved oxygen ½ milligram per litre.

After second 12 hours' agitation, dissolved oxygen 1 milligram per litre.

After third 12 hours' agitation, dissolved oxygen ¾ milligram per litre.

Our solutions were at this time very foul. The figure given by the pemanganate test for reducing matter was equal to a consumption of 912 (nine hundred and twelve) milligrams per litre. Yet the extraction was good. The original assay was 12.7 ozs. No barium peroxide was used. The final residue was 8.0 dwts = 96.8 per cent. extraction. The above is typical of our experience with this particular black sand.

In view of Elsner's equation, which includes oxygen as an essential for the solution of gold in cyanide solutions, the above figures are interesting.

These experiments were made under the direction of Dr. Caldecott and Messrs. Maxwell and Pearce.

THE RAND GOLD INDUSTRY

The dimensions of the Rand gold mining industry are not easy to grasp, but their magnitude can be gauged by some recent figures. In June the production of gold was approximately $16,000,000. Native employees numbered 170,000, and there was a marked shortage. The New States mill commenced operation, its capacity being 50,000 tons of ore a month, with provisions for increased capacity. Changes now being made at the Durban Deep mine will give it a milling capacity of 35,000 tons a month. Chief of the mines in point of size are, however, the Crown mines, with a monthly capacity of 216,000 tons, and Randfontein Central with 200,000 tons.

RUBIES AND SAPPHIRES

Rubies and sapphires are corundum crystals of red and blue color respectively. Corundum is a fairly common mineral found in such basic rocks as syenite and serpentine. It is found in large quantities in Eastern Ontario in nepheline-syenite, and in some places blue crystals have been taken out, but none clear enough to be of value as gems. In New York state and New Jersey, rubies have been found in crystalline limestone that is banded with gneiss. In North Carolina, these gems have been found in chlorite, mica, and talc, in a dike of olivine and serpentine. In Burmah, long the producer of the finest rubies, they are found in crystalline limestone and gneiss, but are mostly obtained from placers formed by the weathering of these rocks. Sapphires have been found in a peculiar lamprophyre in Montana, and also in andesite in the same state.

Gem corundum crystals, on account of their great hardness and freedom from weathering, have survived the wear and tear of the years; they should be watched for in panning for gold. They can be recognized by their hexagonal form and hardness; they scratch quartz easily.

Humidification of Mine Air

By THOMAS CHESTER

In the *Canadian Mining Journal* for December 29, 1922, an article appeared by John Moffatt entitled "Coal Dust in Winter," pointing out that during cold weather incoming air currents must be humidified to avoid disaster. The 1922-1923 winter was like other cold seasons in that a number of explosions, unmistakably due to coal dust, occurred in the coal mines of North America. Mr Moffatt pointed out how dry coal dust accumulates in a mine in cold weather and that it collects on the floor, the walls and the roof, on the tops and hidden parts of timber and on everything stationary, thereby becoming a standing menace to the safety of the mine.

Causes of Explosions

Dust explosions occur in factories as well as in coal mines and many buildings have been wrecked in this way. Some examples are flour mills, starch factories, chocolate plants, sugar refineries, aluminum factories, etc. Any dried combustible material can be exploded if suitably pulverized and suitably distributed in air. The more finely divided any combustible substance is, the more rapidly it will burn, whether placed in a pile or distributed in a suitable manner in a current of air. Reducing the substance to a powder results in greatly increasing the ratio of the surface of each particle in relation to its weight or mass. Coal in block or lump form will not burn until the surface is raised to the ignition temperature, and the mass has a retarding effect in absorbing heat from the surface. If a combustible substance is powdered finely enough it will burn almost in the same manner as a gas, and powdered coal is now used as fuel in furnaces on this basis.

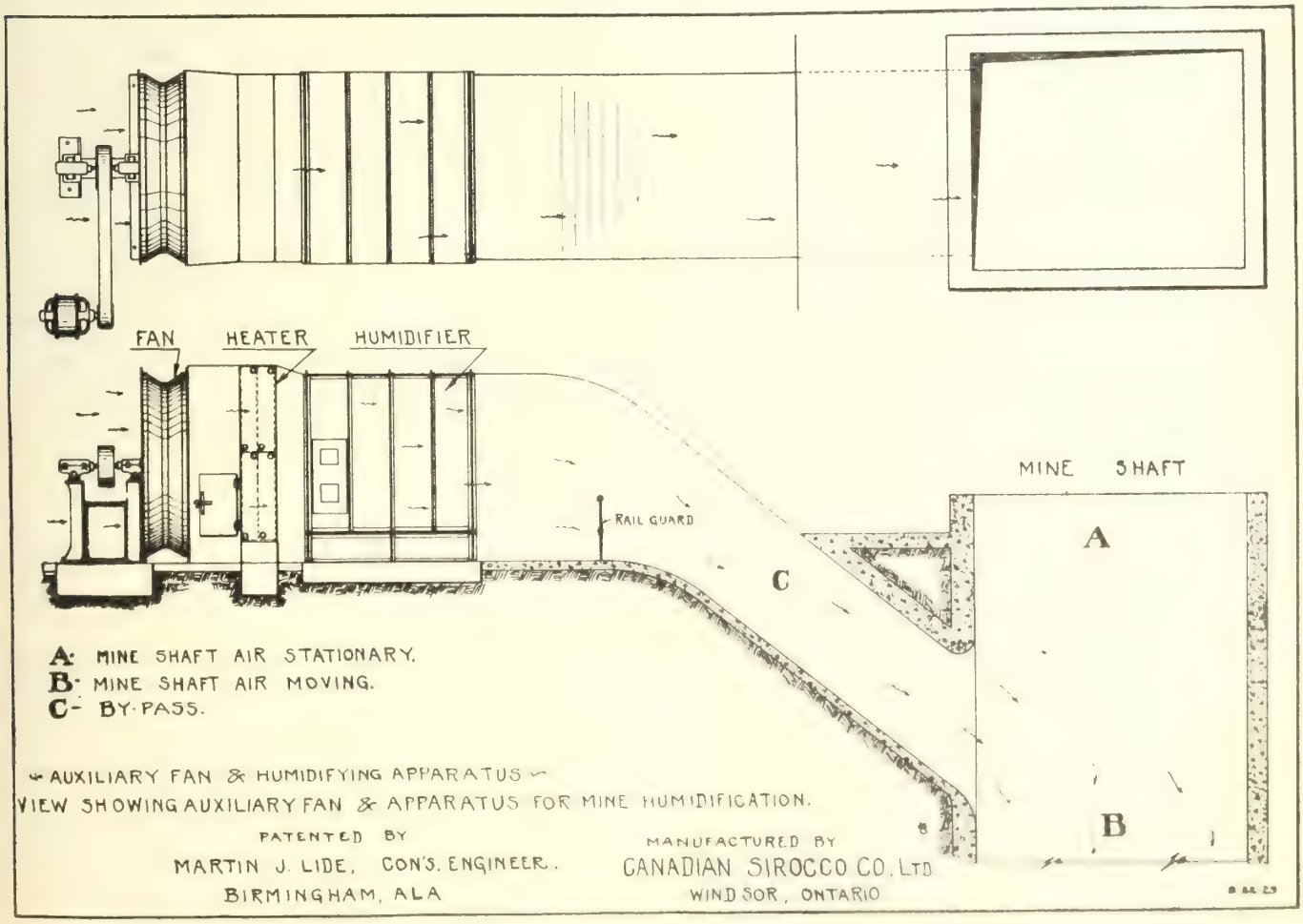
Local explosions occur in coal mines, but these are of very limited extent if gas is not present in great volume or if there is not much dry coal dust distributed along the passages.

Explosions can be produced by the friction of falling rocks on each other or on the rails or other metal, when gas is present, or can be caused by collisions, runaway cars, local gas explosions and blown-out shots. Any one of these can throw enough dust into the atmosphere to start a general explosion, which is intensified as it passes through the mine. After a dust explosion is well under way, the velocity of the detonating wave reaches about 2,000 feet per second with a great development of heat and pressure.

Importance of Vapor in Mine Air

According to a paper read recently to the employees of the Colorado Fuel & Iron Company by Mr. James Dalrymple, Chief Inspector of Coal Mines for Colorado, it appears that in that State during the month of March there is an evaporation of 12,991 gallons, or approximately 54 tons, of water, per 24 hours for each 100,000 cubic feet of air circulated per minute. In January and February the evaporation is even greater but no figures have been published for these months.

This drying out is caused by the air entering a mine in a cold condition and being raised in temperature as it passes along the airways. The effect of this warming is



Lide Humidification Plant

to reduce greatly the relative humidity of the air, which results in water being evaporated from any material containing it with which the air comes in contact. Sprinkling is not always done thoroughly and investigations carried out by the U. S. Bureau of Mines indicate that once particles of coal dust have been thoroughly dried out, it is a difficult matter to get them to re-absorb moisture. In some mines sprays are placed at suitable intervals for delivering finely atomized water to the ventilating currents as the air becomes warmed in its passage through a mine.

Disastrous mine explosions seldom occur in summer because there is a comparatively large amount of water vapor present in the atmosphere in warm weather, as in July and August the outside air contains about 8 grains of moisture per cubic foot. With such a moisture content, if the dry bulb temperature is 90 degrees, the wet bulb temperature will be a little under 76 degrees and the relactive humidity will be about 55 per cent. If this air is cooled to 70 degrees F. it will then be in a saturated condition, that is to say, its wet bulb temperature will also be at 70 degress F., and it will still carry about 8 grains of moisture per cubic foot. If this air is cooled down to 56 degrees it will still be saturated but will then carry about five grains of moisture per cubic foot and the amount of water condensed out of the air will be about three grains per cubic foot, and it is the deposition of this moisture that causes a mine to become wet in summer.

Pre-Heating and Humidifying

The same result can be produced in winter by heating the air to the required temperature and adding moisture before it goes into a mine. If the moisture content of the air is kept sufficiently high, there will be practically no evaporation and very little drying out of coal dust. It is not, however, necessary to pre-heat and humidify the intake air to a summer condition, as all that is needed is to prevent the evaporation of water within the mine, and this can be done if there is no subsequent warming after the almost saturated air enters a mine.

The apparatus used for conditioning the air entering a mine can be employed also to super-saturate the mine air whenever required, that is to say, during holidays or whenever the mine is shut down. This is done by raising the air temperature to permit of picking up enough water to raise the dewpoint temperature above the mean temperature of the mine. When this is done, water will be deposited in the form of dew exactly as occurs in mines during the hot, humid weather of summer.

As previously stated, moisture can be added to mine air by water sprays at suitable intervals; but the common sense thing is to concentrate the air-moistening equipment above-ground, where it can be given adequate attention. In this way it can be controlled easily and any suitable variations in temperature and relative humidity can be produced at will.

When a mine is ventilated by a fan operating as a blower, the air conditioning apparatus can be placed between the fan and the downcast shaft or intake drift. When a mine is ventilated on the exhaust principle the application of the humidifying device is not quite so simple, as it is not desirable to use double doors or ar locks for the purpose of regulating the air flowing into the mine after being suitably conditioned, because this would interfere with the progress of taking out coal.

The Lide System

Mr. Martin J. Lide, Consulting Engineer of Birmingham, Alabama, has developed and patented a system whereby this difficulty can be overcome very satisfactorily. The diagram herewith shows a Lide humidifying system applied to a shaft mine ventilated by a main exhaust fan in the regular way. It will be noted that a Ventura Disc Fan blows air through a heater and then through a humidifier and thence down a sloping by-pass, which connects with the mine shaft some distance below the collar. In this way suitably conditioned air can be blown into the downcast shaft and will then travel through the mine in the regular way under the influence of the depression in pressure caused by the main fan.

By reference to the diagram it will be noted that there is a neutral zone between the bypass outlet and the collar of the mine shaft. No particularly bad effect would be caused by a little cold, dry air being drawn down the mine shaft direct from the outside atmosphere; but, if necessary, this could be avoided by speeding up the Ventura Disc Fan to produce a surplus above the amount of air handled by the main exhaust fan and this surplus would be vented from the bypass outlet through the collar of the main shaft to the atmosphere.

It is not sufficient to blow exhaust steam into the air entering a mine, as this produces a very wet condition and causes falls of the roof from the combined effect of water and heat. With the Lide system, however, the air is merely tempered or warmed to a little above the mean temperature of the mine and is cooled somewhat during the subsequent evaporation of water from sprays in the humidifier. If necessary, exhaust steam can be added to the tempered air instead of using atomized water, and in either case this can be done under the control of sensitive instruments so that both the temperature and relative humidity can be maintained constantly as required. This is a somewhat unneccessary refinement, and the main purpose of the Lide system is to make it possible to raise the intake air temperature and relative humidity sufficiently to reduce the tremendous drying out that occurs normally in mines during winter.

It is necessary to have a considerable amount of exhaust steam available for this purpose and therefore mines equipped with power plants can readily instal Lide humidifying systems. However, mines that use purchased power can instal second-hand boilers for making low-pressure steam and low-grade and waste coal can be burned by installing forced draft fans, which makes it possible to operate such boilers at a low cost.

A considerable amount of research work has been done to ascertain the most suitable atmospheric conditions and it has been determined that comfort is dependent upon the wet bulb temperature and air motion. The wet bulb temperature is the real index of the amount of heat in air, and the relative humidity is secondary in importance. The cool air within a mine is more comfortable if it has a high relative humidity than if it is very dry, because the wet bulb temperature is higher in the case of air that is nearly saturated.

If the dust given off by the coal cutting machines it wetted down as soon as produced and if drying out of the mine generally is prevented in cold weather, it will be found that serious explosions can be almost entirely eliminated.

GRAPHITE

Of the hundreds of graphite deposits known in Canada, very few have proved to be of economic value. The difficulty lies in separating the graphite from the other minerals, such as quartz and mica. For the finer grades, for use as lubricant, in lead pencils, and for crucibles and electrotype making, everything of a gritty nature must be removed, and also all minerals that would tend to lower the fusion temperature of crucibles. This concentration is easy with some deposits, particularly with "flake" graphite disseminated in crystalline limestone. Fine grained or "amorphous" graphite is not so easily purified.

The A. I. M. M. E. Excursion

Report of the Trip to Sudbury, Cobalt, Kirkland, Porcupine and Thetford Mines

The twelve days' excursion of the American Institute of Mining and Metallurgical Engineers through Ontario and Quebec, concluded in Montreal last Friday, was, by consensus of opinion, both Canadian and American, a most successful tour. From the time the forces from the South, over a hundred strong under the leadership of Dr. E. P. Mathewson, were joined in Toronto by the cohorts of Canada under Mr. Dresser, until the visitors forsook the stronghold of liberty on Friday, their time and attention were occupied just as fully as they chose with visits to mines,

DR. E. P. MATHEWSON
President, A.I.M.M.E.

mills and smelters, technical discussions and sightseeing tours. They have seen a corner of our Dominion, and have departed with the salutation, "au revoir."

On arrival in Toronto on August 20th, the excursionists were joined by an equal number of Canadians, and all were entertained by the City of Toronto at luncheon. Mayor Maguire welcomed the guests, and Hon. W. F. Nickle, Attorney-General for Ontario spoke of the mutual good-will and understanding of our two national communities. Hon. Charles McCrea, Minister of Mines for Ontario, extended greetings on behalf of the mining fraternity, and announced that he and members of his Department's staff would accompany the excursion throughout the province.

The evening was occupied by a reception in the Parliament Buildings at which Mr. McCrea presided, with the assistance of Mr. Nickle, who outlined in a comprehensive address the possibilities of the north country, indicating the influence our cordial relations with our American neighbors would have on its development. Dr. Mathewson and Dr. A. S. Dwight gave the American view of these same happy international relations.

Special Bulletins of Department of Mines

One feature of the facilities provided for the visitors by the Ontario Department of Mines deserves special mntion. Two bulletins were printed for the occasion, both being parts of the compendious report on the Cobalt area prepared by Mr. C. W. Knight and associates. Bulletin No. 47, "Milling and Metallurgical Practice in Treatment of Silver Ores at Cobalt," by Fraser D. Reid, J. J. Denny and R. H. Hutchison, describes the milling problem, recounts the story of its solution, and describes fully present practice by both the gravity and flotation method, as exemplified in the Coniagas mill, and cyanidation, as at the Nipissing. This report will form a permanent and very valuable record of one of the outstanding accomplishments of Canadian metallurgists.

Bulletin No. 48, "The South Lorrain Silver Area," by Cyril W. Knight, is a 55-page excerpt, complete with illustrations and maps, from Mr. Knight's report. The information and ideas made public in its pages will aid materially in the rational development of this important silver camp. Dr. Miller worked nights and Sundays to get these two bulletins through the press in time for the excursion.

The Sudbury District

Tuesday morning found the excursion's special train at Coniston in the Sudbury district. In spite of a downpour of rain the inspection of the nickel mines and smelters proceeded according to plan. Dr. Corless and his staff showed the visitors over the Mond Nickel Company's model plant and town, where twelve years ago there was merely a favourable railway intersection in the midst of the forest. The British America Nickel Corporation's smelter at Nickelton and the adjoining Murray Mine, where the nickel ore was first disclosed in a railway cutting forty years ago, were inspected next, under the guidance of Mr. Hibbert and his aides. The blast-furnaces here reduce the 3 per cent. ore to a 12 per cent. matte, which is raised to 80 per cent. nickel and copper in basic converters for shipment to the refinery at Deschenes.

The terminus for the day was Copper Cliff, the centre of the International Nickel Company's operations. The famous Creighton Mine hard by has yielded already ten million tons of ore containing 4 per cent. nickel and 1½ per cent. copper, and its reserves are much in excess of this vast amount. This illustrates the magnitude of the district's known resources. The problem confronting our nickel industry is to find adequate uses for its products. Before the war 85 per cent. of the world's nickel was used for war purposes and 15 per cent. in industry. Today these figures are reversed. The present activity round about Sudbury can indicate only that nickel is a vastly more impor-

tant industrial metal than we formerly considered it to be.

Hon. Charles McCrea Outlines Policy

During the course of a smoker in the evening, presided over by Mr. John L. Agnew, Mr. McCrea made an important pronouncement on behalf of the Ontario government. In outlining the policy of the Department of Mines he stressed the need for stable, just and discriminating administration. Only thus can we attract and retain the interest of the investors whose aid we require to find and develop our mineral resources.

"Mining taxation," said Mr. McCrea, "bears definitely upon the welfare of the mining industry. Every government must have a revenue but that revenue should be raised in such a way as to hamper as little as possible legitimitate enterprise or industry. A mining tax should be fair and one which appeals to the natural sense of justice. Our present system is a tax on net profits, after all expenses are met. It is difficut to imagine a fairer or less onerous method of taxation or one better adapted to meet fluctuating conditions from year to year as profits rise or fall.

"A mining tax should not discourage development. The present tax meets this requirement. In the early years of a mine, when it is all outgo and no income, the mine pays no tax. Not until it reaches a productive and profitable stage does the tax take effect, and then the mine can afford to pay it. Further, a tax on profits does not operate against the opening up of low-grade deposits, or those in which the chance of success is, to a certain extent, speculative.

"A mining tax should be stable. The amount of taxation must have relation to the amount of revenue the government requires but frequent or violent changes in the rate are to be avoided. Better have fifty mines at work yielding a moderate profit and paying a moderate tax than five mines operating bonanzas with lower grade ore bodies lying unworked."

Mr. McCrea mentioned also his intention of extending the scope and the extent of his Department's geological work, and referred briefly to the fact that upon the provincial authorities rests the responsibility for suppressing fraudulent enterprises without impeding honest business. Mr. Thos. W. Gibson followed with a clear and concise survey of the progress of the mining industry in Northern Ontario, and Mr. T. E. Godson enlivened the proceedings in a characteristically humorous explanation of his duties as Mining Commissioner.

Cobalt and South Lorrain

During Wednesday and Thursday the excursionists found how thorough had been the arrangements made for their entertainment and instruction at Cobalt and South Lorrain. The mills and mines of the camp were thrown open for inspection. Of particular interest was the unique display of ore specimens gathered at the Nipissing mill from the whole camp. All the silver has not gone out of Cobalt yet — not by a long shot! In South Lorrain similarly spectacular ore was inspected in place in the Woods vein.

During a technical session on Wednesday evening, Dr. Miller recounted incidents from the history of Cobalt, with which he has been associated so intimately from the beginning. He stressed particularly the fact that the study of the geology of the Cobalt region has provided the key to the rocks of a large part of Northern Ontario. Dr. J. Mackintosh Bell, to whom is due in large measure the renewed development in South Lorrain, pointed to the concomitant result in the economic sphere; Cobalt's development has hastened and facilitated the whole of Northern Ontario's subsequent mining activities. The mining men of Cobalt earned the thanks of the visitors, both Americans and Canadians, for the pains they took to prepare and carry through an unusually fine programme.

The Gold Camps

The inspection of the Kirkland mines and mills on Friday was preceded by talks by Mr. P. E. Hopkins on the geology of the camp and by Mr. Jas. G. McMillan on the mining methods. The model mills placed at intervals along the three-mile ore-zone were the feature that attracted most attention. The camp's metallurgy is an exact science, and its mills are practical perfection.

Next morning, Saturday, was occupied in examining the Abitibi pulp and paper mill at Iroquois Falls, which, with an output of 25 cars of newsprint a day, is the largest mill of its kind in the world. During the afternoon a first view of the "big three" mines of Porcupine was afforded, and a study of these and some of the lesser properties occupied the next day. Here, as in the other camps, the resident committee had provided every possible facility to entertain and instruct the guests during their thirty hours in this, the most important gold mining district on the continent. The expressed opinions of some of the visitors with world-wide experience indicate the world-wide attention this camp has drawn. Mr. R. W. Bissell says it shows clear evidence of long life and of mining at great depth. Messrs. J. W. Mercer and J. V. N. Dorr admire its metallurgical practice and point out that already McIntyre practice has been copied in Ecuador.

Thetford Mines

After a day's travel through northern Quebec on the Transcontinental the excursion reached Quebec, where sight-seeing was the order of the day, a much needed relaxation after the strenuous week just passed. Hon. Frank Carrel and Mr. T. C. Denis received the guests on behalf of the Quebec Department of Mines. Thetford was the next stop, on Wednesday, where a committee under the guidance of Mr. Norman R. Fisher had prepared tours of inspection through mines and mills. The next day was occupied with technical sessions in Montreal, and Friday August 30th, the last day of the trip, was spent appropriately in trips by car or by boat in the environs of Canada's metropolis.

Hon. Charles Stewart's Profession of Faith

"I believe that the future welfare and prosperity of this country depend fully as much on mining as on agriculture, — and that is saying a good deal," declared Hon. Charles Stewart, Federal Minister of Mines, at the banquet that concluded the excursion. Mr. Stewart has learned well this fundamental lesson since taking over the Department of Mines in Ottawa. Both he and the subsequent speakers, Hon. Charles McCrea and Mr. T. C. Denis, wished the visitors godspeed on their return and invited them to come again.

The sentiment of the Canadians who accompanied the excursion was well expressed at this banquet by Mr. John A. Dresser, who, after pointing out that among the guests he recognized as former fellow Canadians

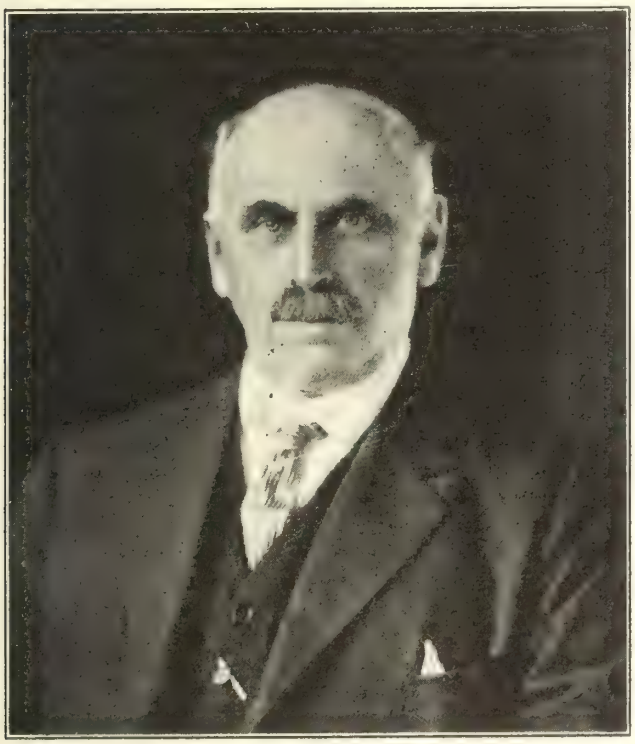
the four eminent metallurgists E. P. Mathewson, E. H. Hamilton, W. J. Hamilton and Forrest Rutherford, went on to say:

"In reviewing the events of your successful excursion, words of congratulation are in order. The design of your tour was well chosen. It has been limited to a radius of, say, 48 hours travel from New York or Chicago and yet the variety has been, I trust, sufficient for the purpose of so short a visit.

"For the pleasure of the trip, which depends so much on a arrangement of details, a huge debt is owing to the indefatigable care of your Secretary. With characteristic kindliness he was unfailing in provision for every step. I wonder if he realizes to the full his success in bringing this large party of adventurers through this long and hazardous tour in the wilds of Canada without mishap, if not disaster.

Mr. Dresser Outlines Opportunities in Canada

"But seriously and sincerely, let me in few words convey the hope of our Institute that your visit may have given pleasure to you, as it has to us, and that



MR. JOHN A. DRESSER
President, C.I.M.M.

you may carry to your homes only pleasant recollections of this little 'peep' into two small corners of two of our Provinces. I will not repeat what you have seen —if it interested you, may you soon come again and see more. We have several Provinces and they have many corners of interest.

"Some wag has said that Canada is alright only that it is too big for its population. Others compare us to a frontier farmer who has more land than he can fence or till. Thanks to you, our good and only neighbor, we do not need fences. But when it comes to utilizing our vast heritage, which the cost of four long years of destructive warfare compels us to hasten, serious difficulties over-hang our Committee of Ways and Means. We seem to have more Ways than Means. For instance we have railways and waterways, and highways, but we lack means to use them. That is to say, we have expended largely on transportation facilities and water power developments, and now in the shadow of the Great War we lack capital to take advantage of the opportunities these works have created for us. Our farm and forest production is steadily advancing; but to make our mineral resources earn more for the benefit of our country and our people is one of the great tasks now before us.

"This is, of course, an inevitable stage in all pioneer life, — a life which, by the way, it is frequently said, does not pay. The truth of this statement, however, depends on the ideal. All people worth while have always struggled to leave their country and the means of life in it better than when they entered it, and we propose to do the same. Your thoughtful humorist, Artemus Ward once described the attitude of the man without ideals as saying of Christopher Columbus. 'Chris. meant well enough, but he was an awful fool to spend all that money just to discover America. What was he going to do with America when he had it all discovered? If he had put the money into Bay State Gas or Manhattan Traction Stocks he would have been able to live on Fifth Avenue long ago.'

Common Interests of Americans and Canadians

"However, we expect to grow and to become a nation of importance in the world. We do not intend to sell our country, but we are glad to have our neighbors come and help develop it and to share in the profits of its development. In every Province of Canada we want capable people, people who know an opportunity when they see it, and seeing it, have the courage and efficiency to make use of it, to our mutual benefit. We offer to you the rights and privileges that we ourselves enjoy. We have a surplus of unused resources, you, a surplus of capital. Neither is useful until it is employed. Employ your capital in utilizing our resources and the reserve side of the bargain will afford a profitable opportunity to each of us. It is the familiar mining contract of putting the property against the money to work it, which is always based on mutual confidence.

"Descended from a common ancestry, a race of pioneers and traders, we are closest neighbors in place and kin and creed. The common ideals and warm sentiments that bind your great country with the great Empire of which we are a part is the strongest safeguard of civilization in the world today. Let it be strengthened by our best efforts in sympathetic understanding and neighborly co-operation. In a word, let us live the course forecast for us in the last public words of your late President Harding. To this end, no more practical and effective step could be taken than the visit with which you now honor us. We thank you for it. We wish you God-speed and an early return."

In thanking all those in Canada who had contributed to the success of the excursion, Dr. Mathewson made special mention of the help, both personal and by means of printed reports and maps, afforded by the three Departments of Mines at Toronto, Ottawa and Quebec. This official aid was, he said, a new experience to the touring members of his Institute, and had done much towards making the Canadian excursion a landmark in the memories of himself and his confrères.

THE MINING DISTRICTS

By THE JOURNAL'S CORRESPONDENTS

QUEBEC

Despite the handicaps of a late season, transportation difficulties beyond the ordinary, and the prevalence of heavy overburden, the prospecting season in northwestern Quebec has been successful already. The bush fires have cleared the surface in places and a more comprehensive view of outcrops was thus obtained. If there have been the inevitable disappointments, there have been also enough "finds" of importance to justify the confidence that this section of Quebec will have important gold mines.

Lake Fortune has the elements essential to mining and milling operations. The ultimate extent of the ore-bodies cannot be foretold. Elsewhere in the vicinity it has been ascertained gold occurs over extensive areas.

One block of ground on which high hopes were based has been abandoned by those who held the options, who did not see their way clear to meet the second payment. Offsetting this is the knowledge that a large, new showing on the Chadbourne claim of the Noranda Mining Co. in Rouyn township promises well.

In addition there is the fact that diamond-drilling on the Stabell property on the Harricanaw has disclosed a shear zone in which the values indicated have prompted new owners to sink a shaft to a depth of 500 feet. According to report, the sixteen short boreholes put down have made the Stabell more than a prospect. The results from twelve of these, 100 feet apart, and the remaining four, spaced at 200-foot intervals, have sustained the favorable opinion of those who had examined the outcrop and considered it of great promise. The twelve holes were stopped at 150 feet, and the four went to 300 feet. Eight of them were under the section sampled repeatedly during recent years and its extension under a swamp. The shear zone where penetrated is said to be about 60 feet wide. One section at 300 feet depth gave $26.00 over 19 feet. In another place ten feet ran $7.50.

More recently a discovery has been made between Rouyn township and the Transcontinental Railway. Should this prove to be a valuable "find," it will have a decided influence in extending the width of the east-and-west strip of good prospecting ground.

The Lake Fortune discovery has stimulated activities in the vicinity. An Ottawa syndicate composed of Redmond Quain, Frank Ahearn, Mrs. Ahearn and R. C. Gamble, who hold an area of 1,100 acres between Olier and Renaud Lakes, adjoining the Lake Fortune property on the south and east, have sent in a gang of men to do development work. This property covers a large intrusion of porphyry, but, unfortunately, the surrounding rocks of the Temiskaming series are covered with rocks of the newer Cobalt series.

The Irma Oil Development Co. is building a rig near Irma in Sec. 28, Tp. 45, R. 9 W of 4th meridian, in east central Alberta, and will put down a well with a rotary drill.

NORTHERN ONTARIO

The A. I. M. M. E. Excursion at Cobalt. — The visiting party from the American Institute of Mining and Metallurgical Engineers has completed its tour of the Northern Ontario mining camps. It was unfortunate that the weather was not better; it was cold and rainy most of the time. However, there was one good day in Cobalt, at least, which was fortunate as it was the day on which it had been arranged to take the party to south Lorrain and for a boat trip on Lake Temiskaming. One of the most interesting features of the Cobalt trip was the display of silver ores on view in the Nipissing refinery. The specimens were contributed by all the different mines, and embraced nearly all the minerals found in the district. It is probable that nowhere else in the world could such a display of silver ores be got together. The Hon. Chas. McCrea, Minister of Mines, spoke in both Sudbury and Cobalt, outlining the work of the Department. He laid stress upon the fact that it was the desire of the Government to create a feeling of confidence in the mining industry and of stability with regard to titles and taxes. The Government does not propose to change the mining taxation, so that there will be no uncertainty in the minds of foreign investors regarding this important item. Mr. McCrea also stated that it would be the policy of the Government to build roads to promising mining districts and to construct railways where the developments warranted. The work of the Province's geological staff will also be extended, and an effort will be made to have geological surveys made of promising districts that justify work by the prospector.

Porcupine — Several Porcupine companies have extensive shaft sinking programs underway at present. Work has been started on the 1000-foot, three-compartment incline shaft of the Davidson. Electric energy for this work is being obtained from the Great Northern Power Company. The Goldale shaft has reached 900 feet, and will shortly be at the 1000-foot level where development work will be undertaken to explore the ground under the discovery on the 500-foot level. On the Newray, adjoining the Goldale, preparations are practically completed to carry the shaft to a considerable depth, and it is expected that it will also reach 1000 feet. The shaft on the Rochester property is down 550 feet, with a level at 500 feet, but no extensive development work will be undertaken until the shaft has reached 1000 feet. The McIntyre is considering the sinking of a new shaft, which eventually will reach a depth of 5000 feet, but so far nothing definite has been done regarding this work.

The split up of of the Dome shares has been delayed for several weeks, due, it is said, to the failure of the engraving company to deliver the new certificates. When these are ready two shares of the new stock will be issued for each share of the old, and it is expected that about that time the company will list its shares on the London market.

The Hollinger has declared the regular four-weekly dividend of 1 per cent, payable September 10th to shareholders of record on August 23rd. Although additional machinery is being installed in the mill, the management does not propose to increase the output until an ample

supply of electric power is available. The management evidently looks forward to another power shortage next winter, although conditions throughout Northern Ontario are very favourable, as the season has been exceptionally wet and more rain has fallen than for several years. The Northern Canada Power Company has several thousand horsepower available for distribution and has not been forced to draw on its storage basins. The machinery for the Hollinger power development on the Abitibi River has been ordered, but so far there is little activity at the power site.

At the Vipond, No. 10 vein has been cut on the 6th level, where it shows substantial values. This is the vein found a few months ago, which has now been located at several points between the surface and the 1,000-foot level. It is of higher grade than the other veins so far developed on the property, and it was this discovery that led the management to make preparations to resume milling. The entire treasury stock of the company has been taken up under the terms of the option entered into last year, and as a result the company is amply financed and is expected to enter the producing stage with approximately $50,000 cash on hand.

Matachewan — Only a small amount of work is being done in the Matachewan area. The work on the British Matachewan Gold Mines is being confined to diamond-drilling. In view of the statements made by the promoters who were endeavoring to sell the stock of this company, it was to be expected that more active progress would have been made. According to these statements the company has a large amount of ore blocked out, and is, in fact, a second Hollinger, needing only a mill to make good its claims. The company, however, seems satisfied, for the time being at least, to confine its main efforts to selling stock. The Matachewan General Mines Limited is the name of a new company which owns 63 acres between the British Matachewan and the Davidson, and it is proposed to explore this by diamond-drilling. On the American Matachewan claims, only assessment work has been done, but a small gang of men has started work on the Powell Matachewan.

Market Manipulation — The recent fluctuations in the stock of the Hattie and Beatty mines has resulted in legal actions for substantial amounts being taken. Dr. W. P. St Charles entered into an agreement with John K. Papassimakes to buy up all available Hattie and Beatty stock for their joint account. Dr. St. Charles claims he was misled by reports of assays submitted by Papassimakes, which he believes to be fraudulent, and was further misled by representations that English capital had become interested. Relying on this, he entered into an agreement with Papassimakes and now claims that Papassimakes unloaded his personal holdings on the market and refused to carry out his obligations as to a joint purchase. Hattie stock recently dropped from 45 cents to 8 cents a share.

NOVA SCOTIA

Coal Output Climbing The output per man at the mines is much higher than it was before the strike, and efforts are being made to help it to climb still further. Workmen are making satisfactory wages, which brings contentment, and most of them are fast forgetting the struggle through which they have just passed. It is evident that, barring trade depression, industrial conditions will be much better in this district than for many years. There is, however, a slight reaction towards the malcontents, due to several causes. One of these is the refusal of the legal authorities to continue the injunction against the district officers ousted from position by John L. Lewis. Another is that the time is drawing near when the new wage agreement will be made, and there are those who believe that strong agitation for the 1921 wages will be successful in splitting the men into two separate bodies. The irreconcilables who believe this are most active among the workmen, and their activities are not to be held lightly, for they will push to the utmost their efforts to form a new labor organization when conditions are ripe. That such a union will have for its purpose industrial and political control and will use such destructive weapons as strike and sabotage, there can be little doubt. However, pitted against them are able and experienced leaders from the United States, who know the game and how to play it, and chances for the success of the "Red" campaign will be slim indeed.

Mainland Locals Want Election — There are rumors that the mainland Locals are anxious for an election, and the extreme element are using this to force the hand of John L. Lewis to bring on an election at an early date. This will not be done, and it may lead to Cumberland and Pictou county locals separating from the main body in Cape Breton. This might be a blessing in disguise to the miners of both counties, who for upwards of two years have been very much dissatisfied with the actions of their brother workmen in Cape Breton.

General Works Committee Elected — The steel industry had also settled down to normal conditions, and both the employer and employees are beginning to find that it is good for all to dwell together in unity. The workmen of Sydney steel plant have now elected their representatives on the General Works Committee, and these are getting down to business in earnest. The fine spirit shown by all is notable, and however imperfect the machinery for handling labor disputes may be at the beginning, the "get together" feeling will weld and hold both parties in one body until there is perfect union. Even if some component parts of the machine may not fit well and may cause some little friction, yet constant lubrication will tend towards smoothness and harmonious operation. The new co-operative step has enlivened the hope of the whole community, and all are working together with a will to better the conditions existing on the steel plant, and to make good-will the paramount feeling among all the workmen.

BRITISH COLUMBIA

Stewart — Work on the Dunwell Group of mineral claims, near Stewart, Portland Canal District, following the recent uncovering of a promising body of ore, is being carried forward with all possible dispatch. Drifting on the two veins in No. 2 tunnel goes on unceasingly and a considerable quantity of ore showing argentite and native silver is being put aside for shipment. At the portal of No. 3 tunnel a site is being cleared for the erection of mine plant, buildings, etc. and simultaneously a good trail is being constructed to the property. A compressed air pipe line, 7,500 feet long, is being laid from the old Portland Canal Mine compressor plant up the hill to the Dunwell. It is expected that all preliminaries necessary to permit development throughout the winter will have been completed in the course of a few weeks.

The operators of the L. & L. Group have been encouraged by breaking into high-grade ore when driving

a short cross-cut a few feet from the face of their tunnel.

Some first-class specimens of fine-grained galena, the quartz gangue of which is stained with silver chlorides, are reported to have reached Stewart from an outcropping on the north fork of the Marmot River. P. E. Reese is the discoverer, and old time prospectors state that the samples recall the rich silver ores of Colorado and Montana.

The Granby Consolidated Mining & Smelting Co. is reported to have abandoned its options on the George and the Sunshine Groups, copper properties situated respectively on Bear River and Glacier Creek, Portland Canal District. The Company continues to explore and develop the Outsider Group, Maple Bay, which shipped regularly some twenty years ago when controlled by the Brown Alaska Mining & Smelting Co., which operated a copper smelter at Hadley on Princess Royal Island, Alaska. There are two well defined veins, one of which can be traced for half a mile up the mountain. The copper content is said to average 2 per cent. The Company is understood to have planned much diamond-drilling as well as other development.

Smithers — Following the announcement that the Guggenheims have acquired a majority interest in the Henderson Group and other of the Duthie holdings at Hudson Bay Mountain, near Smithers, northern British Columbia, comes the report of the location of a large copper deposit on Copper River in the same district. It is alleged by another prospector that he has found tin-bearing ore on Porphyry Creek, near East Hazelton. If this should be confirmed it will be something new and unique for this part of western Canada. Samples have been submitted to the government mining engineer for test. The provincial government's new road from Smithers to the Duthie mines is expected to be ready for use within a week, which will materially improve mining conditions.

Rossland — The highest grade ore ever shipped from a lode mine in the interior of British Columbia is reported to have been produced by the "Golden Drip", which adjoins the "I.X.L." in the Rossland district. From time to time gold quartz shipments have been made from the "I.X.L.", the returns from which have been astonishingly high. Unfortunately the operators have not been able to find more than stringers and pockets of this highly valuable quartz, but their occasional finds have repaid the work involved and the promise of more ore further on has given an even greater zest than usual to the development work. The adjoining claims, known as the "Golden Drip" Group, are being developed by M. E. Purcell, formerly general manager of the Rossland Mines of the Consolidated Mining & Smelting Co., and the production here of ore similar to that found on the "I.X.L." is considered both significant and encouraging.

Promising Silver-Lead Prospects—George H. Aylard of Victoria ,president of the Standard Silver-Lead Mining Co., has returned to the Coast after visiting the Ivy Fern Mine, Cultus Creek, Kootenay Lake, and the McAllister Mine on the north fork of Carpenter Creek in the Slocan District. Mr. Aylard's company is developing both these properties, having a half interest in the former and a bond and option on the latter. He was accompanied on his inspection by W. H. North, general manager of the company. On the Ivy Fern a strike has been made which is regarded as important. Four or five feet of good milling ore has been uncovered under conditions indicative of substantial reserves. A plant is to be installed on Cultus Creek to supply power, and further development has been ordered to be commenced. Work on the McAllister Mine also is said to be making satisfactory progress. The company of which Mr. Aylard is the head has a good-sized fund for the opening up of just such properties as those instanced and it is confidently predicted that one or the other, or both, of those prospects soon will be put on a shipping basis.

Kimberley Mill Completed — The concentrating mill of the Consolidated Mining & Smelting Co. at Kimberley has been completed and all is reported to be ready for the treatment of the product of the Sullivan Mine close to the mine's portal, a change that will lighten the heavy burden that has been placed upon the Trail plant, as well as effecting a substantial saving in transportation charges. The new mill covers some twelve acres, has a capacity of 2,500 tons of ore a day, and its cost is placed at approximately $1,500,000. Bunkhouses for the accommodation of 150 men also have been constructed. The cooking for the camp is done by electricity.

The new concentrator equipment commences with a coarse crushing plant capable of crushing 7,500 tons of ore every twenty-four hours, with a 1,000-ton receiving bin from the mine and a 2,500 ton railway bin, to receive ore from the crushing plant. The latter bin discharges into standard railway cars and is transferred to the mill three or four miles away. It was necessary to locate the mill some distance from the mine in order to get sufficient impounding gounds for tailing and a suitable mill site.

The ore is weighed over standard railway scales and is discharged into a 1,000-ton receiving bin in connection with the fine crushing plant. This plant reduces the ore to ½ inch and has a capacity of 7,500 tons every twenty-four hours. The product of the fine crushing plant is discharged into the 2,500-ton mill bin from which it is drawn to feed the mill. The mill will have a capacity of from 2,500 to 3,000 tons per day, the process being selective flotation, to remove first the lead content of the ore as a high-grade lead concentrate; second, to remove the zinc with a small part of the lead, as a zinc concentrate.

The mill is equipped to table any of the products when necessary. The process has been tested thoroughly in the Trail concentrator, which has been handling from 1,000 to 1,100 tons of ore per day for over a year, and is the outcome of research work done by the Consolidated Company in their own plant at Trail. A further advance in progress for Trail was attained when, outside of the primary crusher and the motors, practically all the machinery for the "Big Sullivan" mill was made in the Consolidated shops. In order to accomplish this, it was necessary to build a new foundry and to add a considerable amount of machinery to the various shops. All the buildings of the Sullivan mill and the ore bins are composed of steel and concrete. The roofs are made of 2 x 4's on edge covered with Barrett specification roofing, with tar and gravel surface, reducing the danger of fire to a minimum.

Lillooet — It is difficult to obtain authentic information of mining activity in the Whitewater district, which lies north of Lillooet in the Clinton Mining Division, but all reports speak of important results in the development of old prospects and of the location of many new claims. The Whitewater Gold Fields Ltd. have a crew of twelve men at work on the Taylor claims, the promising nature of which first directed attention to the district. A Ross mill has been installed and an assay office built and equipped. General camp accommodation also has been provided. This work appears to have

occupied most of the time of the men up to the present. The intention is to operate throughout the winter and it is assumed that shipments of ore will be made over the snow to the Pacific Great Eastern Railway at Williams Lake.

The Patricia Group in the same district, was bonded by Messrs. Trites, Wood and Wilson, who have had men under competent direction driving a tunnel. They are said to have gone in 200 feet with results that justify expectations.

A. W. Lohmann, of Tacoma, Wn., who spent several weeks in the Whitewater, is quoted as comparing it to Cripple Creek, there being "the same sort of formation in which the gold is free and highly concentrated."

Trail Ore Receipts — Ore receipts at the Trail Smelter of the Consolidated Mining & Smelting Co. for the week Aug. 7 to 14 totalled 6,091 tons, as follows:

Alamo, Alamo	99 tons
Bell, Beaverdell	45 "
Black Rock, Northport	188 "
Company Mines	5,031 "
Cork Province, Zwicky	42 "
Knob Hill, Republic Wn.	55 "
Lone Pine, Republic Wn.	225 "
Quilp, Republic Wn.	53 "
Rosebery-Surprise, New Denver	87 "
Ruth, Sandon	47 "
Silversmith, Sandon	183 "
Standard, Silverton	36 "
Total	6,091 "

POSITION OPEN FOR GEOLOGIST

The Civil Service Commission, Ottawa, have announced that applications will be received until September 20th for the position of geologist, as follows:

5957.—A Geologist for the Geological Survey, Department of Mines, Ottawa, at an initial salary of $3,600 per annum, which will be increased upon recommendation for efficient service at the rate of $180 per annum, until a maximum of $4,500 has been reached.

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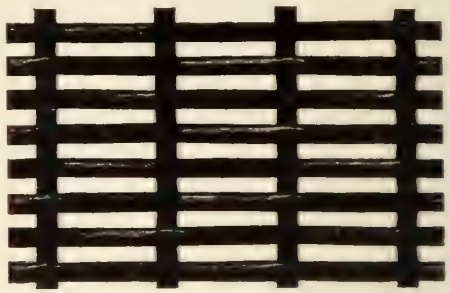

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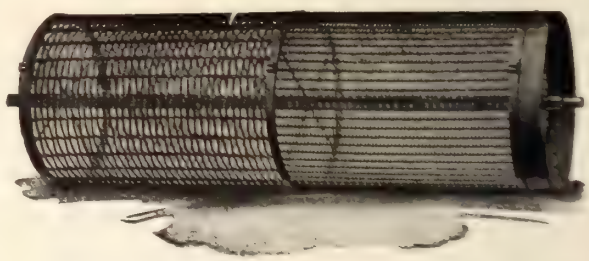

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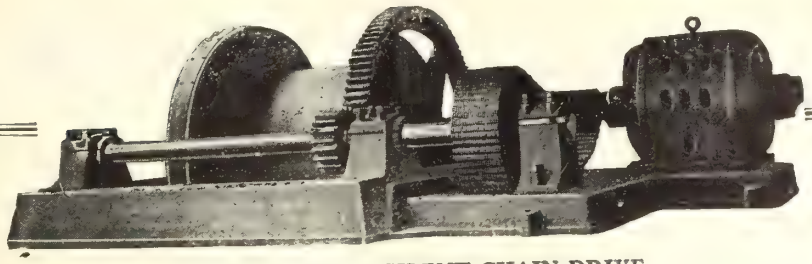

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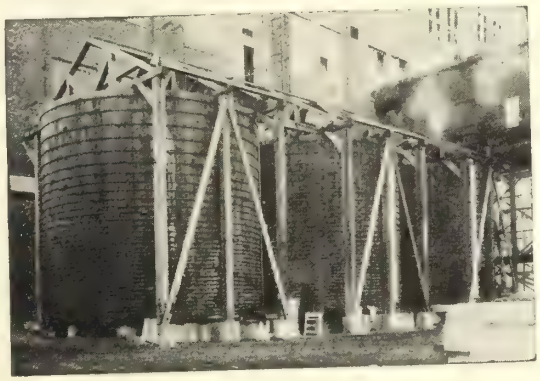

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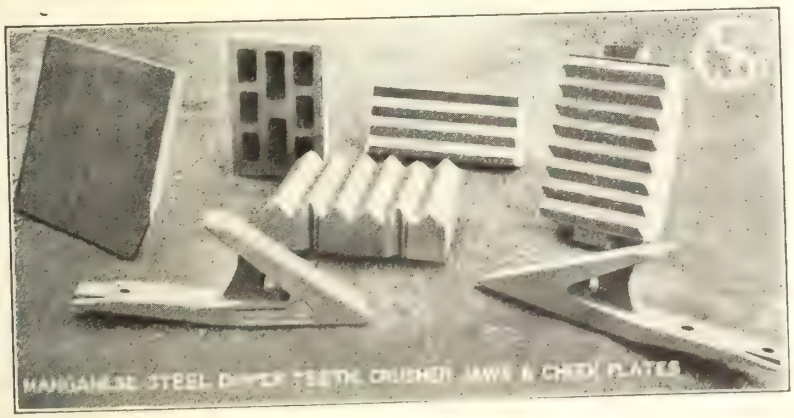

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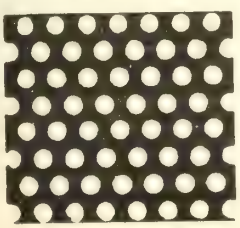

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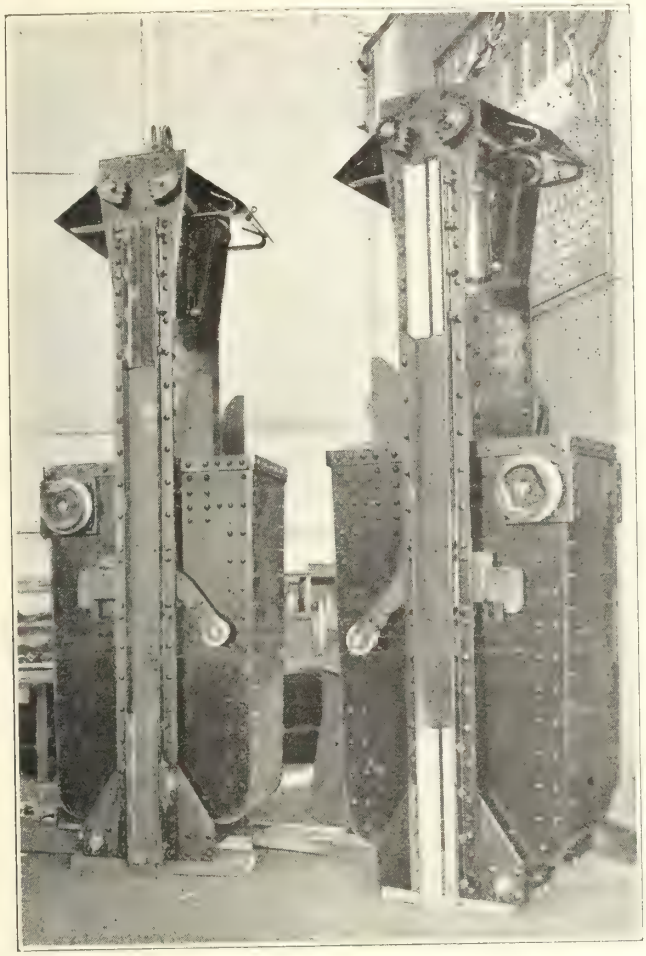

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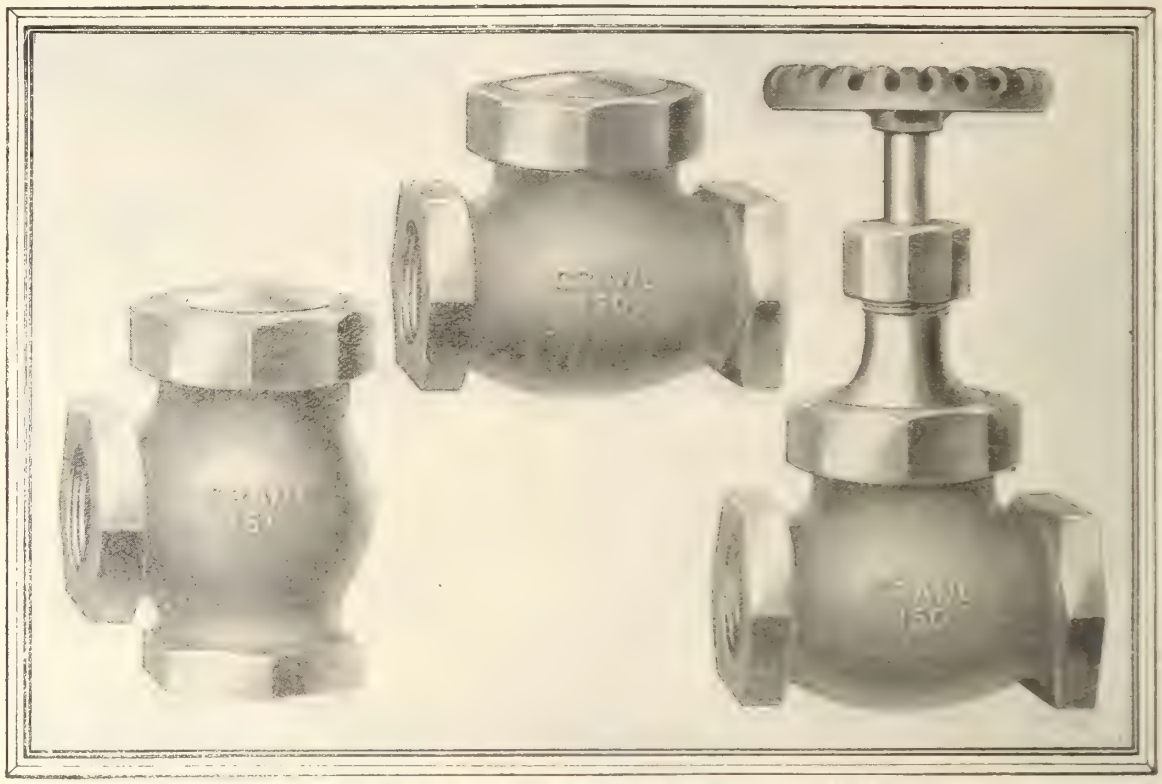

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DEPARTMENT OF MINES

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MINES BRANCH

Recent Publications

Talc and Soapstone in Canada, by H. S. Spence.

Titanium, by A. H. A. Robinson.

Summary Report of Investigations made by the Mines Branch during the calendar year ending Dec. 31, 1921.

Phosphate in Canada, by H. S. Spence.

The Preparation, Transportation and Combustion of Powdered Coal, by John Blizard.

Road Materials along the St. Lawrence River, from Quebec Boundary to Cardinal, Ont., by R. H. Picher.

Barium and Strontium in Canada, by H. S. Spence.

The Coal-fields and Coal Industry of Eastern Canada, by F. W. Gray.

Analyses of Canadian Fuels. Part I to V, by E. Stansfield, M. Sc., and J. H. H. Nicolls, M. Sc.

Graphite, by H. S. Spence.

Gas Producer Trials with Alberta Coals, by J. Blizard and E. S. Malloch.

The Mines Branch maintains the following laboratories in which investigations are made with a view to assisting in the developing of the general mining industry of Canada:—

Fuel Testing Laboratory.—Testing value of Canadian fuels for steam raising and production of power gas; analyses, and other chemical and physical examinations of solid, liquid and gaseous fuels are also made.

Ore-Dressing Laboratory.—Testing of Canadian ores and minerals, to ascertain most economical methods of treatment.

Chemical Laboratory — Analyzing and assaying of all mineral substances and their manufactured products. Copies of schedules of fees, which are slightly in excess of those charged by private practitioners, may be had on application.

Ceramic Laboratory.—Equipment is such that complete physical tests on clays and shales of the Dominion can be made, to determine their value from an economic standpoint.

Structural Materials Laboratory.—Experimental work on sands, cements and limes is also undertaken.

Applications for reports and particulars relative to having investigations made in the several laboratories should be addressed to The Director, Mines Branch, Department of Mines, Ottawa.

GEOLOGICAL SURVEY

Recent Publications

Memoir 108. The Mackenzie River Basin, by Charles Camsell and Wyatt Malcolm.

Memoir 127. Beauceville map-area, Quebec, by B. R. MacKay.

Memoir 128. Winnipegosis and Upper Whitemouth River areas, Manitoba, Pleistocene and Recent deposits, by W. A. Johnston.

Memoir 129. Geology of the Moncton map area, by W. J. Wright.

Memoir 130. Geology and mineral deposits of the Bridge River map-area, British Columbia, by W. S. McCann.

Memoir 131. Kenogami, Round and Larder Lake areas.

Memoir 132. Geology and ore deposits of Salmon River district, British Columbia, by S. J. Schofield and G. Hanson.

Memoir 133. The southern part of the Sydney coal field, Nova Scotia, by A. O. Hayes and W. A. Bell.

Map 68A. Moncton, New Brunswick. Geology.

Map 155A. Portions of the districts of Algoma, Sudbury and Timiskaming, Ontario. Geology.

Map 1585. Mackenzie River basin, 1922 edition. Geology.

Map 1751. Wainwright, Alberta. Topography.

Map 1752. Monitor, Alberta and Saskatchewan. Topography.

Map 1767. Sydney, Nova Scotia. Geology.

Map 1830. Vermilion; townships 47 to 55, ranges 5 to 10, west of the fourth meridian. Topography.

Map 1831. Vegreville; townships 47 to 55, ranges 11 to 16 west of the 4th meridian, Alberta. Topography.

Map 1860. Keno Hill area, Mayo district, Yukon. Geology.

Map 1948. Wanapitei Lake area, Ont. Geology.

Map 1964. Brockville-Mallorytown area, Leeds county, Ontario. Geology.

Map 1965. Fraser River delta, British Columbia. Geology.

Map 1972. Michipicoten area, Ontario. Geology.

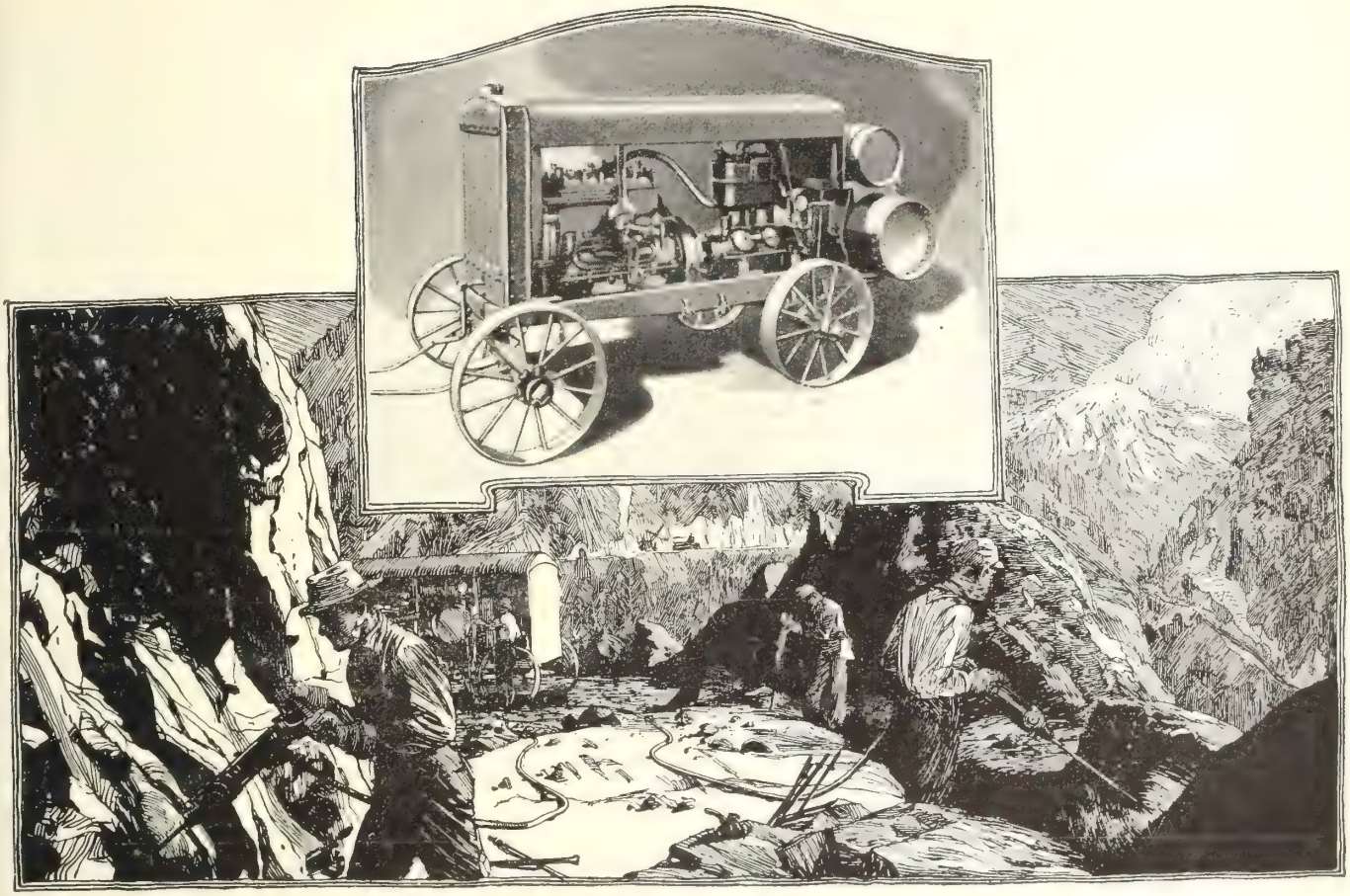
Map 1977. Mackenzie river between Norman and Beaver river, district of Mackenzie. Geology.

Applicants for publications not listed above should mention the precise area concerning which information is desired.

Summary Report — The annual Summary Report of the Geological Survey is now printed in parts. Applicants should, therefore, state what particular geologist's report is required, or what subject they are interested in.

The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon.

Communications should be addressed to The Director, Geological Survey, Ottawa.



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Ontario's Minerals

PROVINCE OF ONTARIO

Hon. CHARLES. McCREA, Minister. DEPARTMENT OF MINES *Thos. W. Gibson*

Mineral Areas

Ontario, with its 407,262 square miles, contains many millions of acres in which the geological formations are favourable for the occurrence of minerals 70 per cent of the area being underlain by rocks of pre-Cambrian age. The phenomenally rich silver veins of Cobalt, Gowganda and South Lorrain occur in these rocks; so also do the far-famed nickel-copper deposits of Sudbury, the gold of Porcupine and Kirkland Lake, and the iron ore of Magpie and Moose Mountain mines.

Economic Minerals

In addition to the above, practically all economic minerals (coal and tin excepted) are found in Ontario: — actinolite, apatite, arsenic, asbestos, cobalt, corundum, feldspar, fluorspar, graphite, gypsum, iron pyrites, lead, mica, molybdenite, natural gas, palladium, petroleum, platinum, quartz, salt, talc and zinc. This Province has the largest deposits on the continent of talc, feldspar, mica and graphite.

Building materials, such as ornamental marble, limestone, sandstone, granite, trap, sand and gravel, lime, Portland cement, brick and tile, meet every demand.

Mineral Production

Preliminary returns show the output of the mines and metallurgical works of the Province for the year 1922 to be worth $62,202,169, of which the metallic production was $38,190,711.

The following figures show the growth of Ontario's mineral industry by five-year periods since 1891 when a Bureau of Mines was first established.

Year.	Value.	Year.	Value.
1891	$4,705,672	1911	$41,976,797
1896	5,235,003	1916	65,303,822
1901	11,831,086	1918 (Maximum war output)	80,308,972
1906	22,388,383	1921	48,128,387
	Dividends.		

Dividends and bonuses paid to the end of 1922 amounted to $28,096,699 for gold mining companies, and $86,238,185 for silver mining companies or a total of $114,334,884.

Mining Regulations

A miner's license costs $5.00 per annum, and entitles the holder to stake out in any or every mining division three claims of 40 acres each. After performing 200 days' assessment work on a claim, patent may be obtained from the Crown on payment of $2.50 or $3.00 per acre, depending on location in unsurveyed or surveyed territory.

Assay Office

The Provincial Assays Office at No. 5 Queen's Park, Toronto, is maintained by the Department of Mines for the free identification of minerals, free assays under the provisions of the Mining Act of Ontario, and also for general assay work as per the Schedule of Charges which may be obtained on application.

Temiskaming Testing Laboratories

The Department maintains, at Cobalt, an ore sampling and testing laboratory which is now prepared to receive parcels of gold ore from 100 pounds upward, and after sampling and assaying the same to pay to the shipper the value thereof, less treatment charges. The purpose is to afford a market for ores extracted by prospectors and others in developing their mining claims, enabling them to obtain funds which they can use for further work and to report on the most satisfactory method of treatment. Fuller information may be obtained on application to the Manager, Temiskaming Testing Laboratories, Cobalt, Ontario.

Publications

For list of publications, illustrated reports, geological maps and mining laws, apply to

Thos. W. Gibson,
Deputy Minister of Mines,
TORONTO, CANADA

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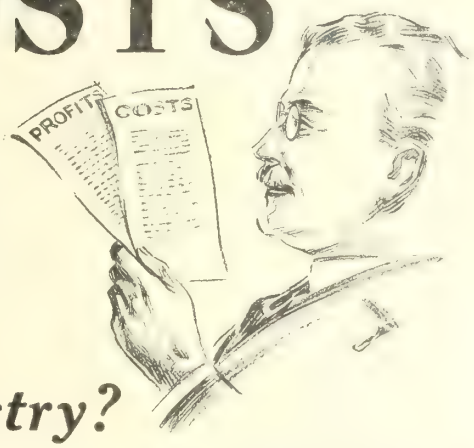

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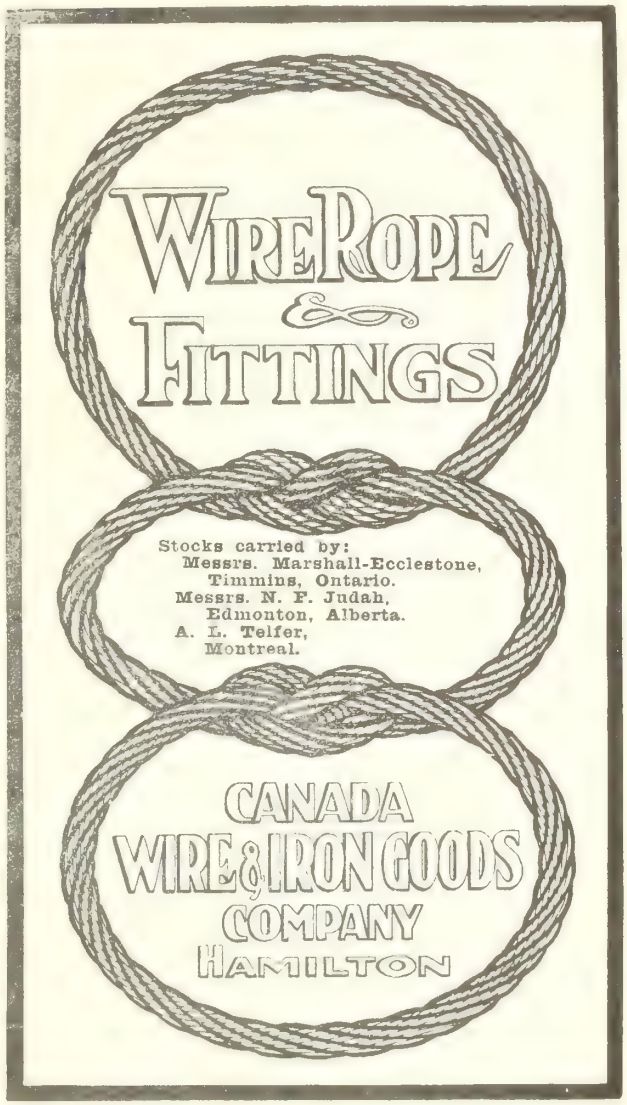

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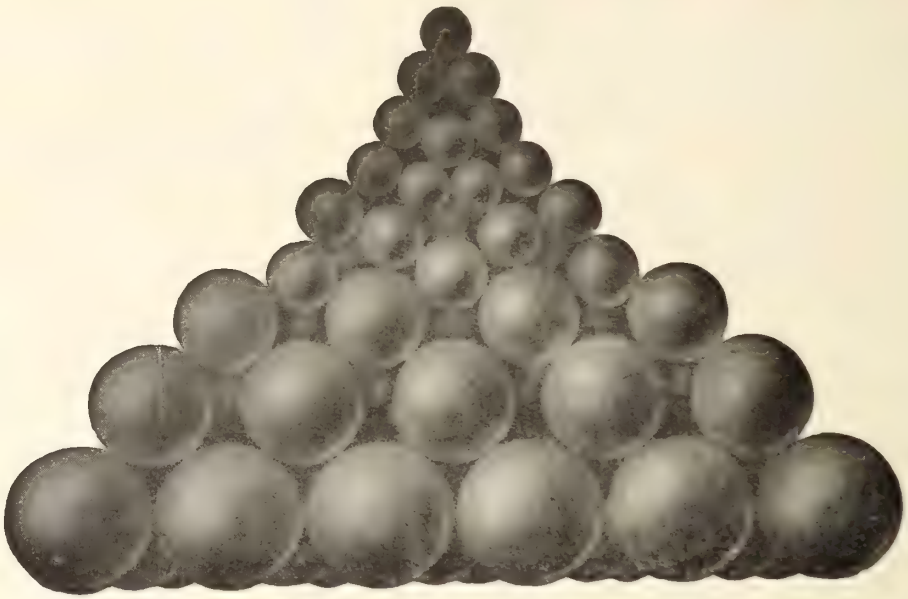

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CANADIAN MINING JOURNAL

PUBLISHED WEEKLY

Devoted to the Science and Practice of Mining, Metallurgy and the Allied Industries; and more particularly to their progress in Canada

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:-: EDITORIAL :-:

QUEBEC GOLD REPORT PUBLISHED

The interim reports on the Opasatika and Duparquet map-areas, which cover the western part of the gold-field of northwestern Quebec, are now available in *Summary Report*, 1922, *Part D*, of the Geological Survey, Ottawa. Fortunately for those interested in developing the area, as well as for the usefulness of the data gathered by the field parties last summer, Dr. Cooke wrote summary accounts of the district, which were published in the *Canadian Mining Journal* on April 13th and May 25th. During the first week of June the maps of the two areas were ready for distribution in Ottawa, and by the end of the month that part of Dr. H. C. Cooke's report bearing more particularly on the economic problems was made available to the public in the 1922 report of the Bureau of Mines, Quebec.

The Summary Report was designed originally to make available to the public promptly after the close of the field season such interim reports and minor reports as it was deemed advisable to publish in such a form. It fails to serve that purpose at present; but it has other uses that are probably equally as important, and we judge there is plenty of warrant for continuing its publication as at present.

The need for the prompt publication of certain of the reports of the Federal Department of Mines, in both its branches, continues as before. The case cited above illustrates the need, and one expedient for meeting it. We understand that plans are afoot to bridge this obvious gap between the mining public and the technical officers of the Department of Mines, and we trust the public will have the benefit of some adequate provision immediately succeeding the present field season.

THE SOLUBILITY OF SULPHUR IN SLAGS

A notable research on the chemical reactions of the iron blast-furnace was recorded in a paper by Professors Richard S. McCaffery and Joseph F. Oesterle of the University of Wisconsin, presented on August 30th at the Montreal meeting of the American Institute of Mining and Metallurgical Engineers. These two teachers of metallurgy have in progress a series of experiments to determine, for the first time, the quantitative solubility of the sulphides of lime and manganese in the slags of various compositions commonly used in the blast-furnace, and the effect of temperature on this solubility. This investigation has long remained a pressing need, as one of the chief factors in converting blast-furnace practice from the empirical art it is today into the chemically controlled science we hope some day to make it. In this direction lie efficiency, enhanced profits and a lengthened life for the giant units of our iron and steel industry.

This present important advance in the knowledge of ferrous metallurgy is based essentially upon work at the Geophysical Laboratory in Washington by Rankin and Wright, who investigated thoroughly the characteristics of the ternary system lime-alumina-silica, which three oxides are the fundamental constituents of blast-furnace slag. In addition to this basic research, there is the work of Feild and Royster of the United States Bureau of Mines, whereby the temperature-viscosity relations of the whole range of blast-furnace slags were determined. With the results of these two outstanding investigations available, it has been a comparatively simple matter to measure the solubility of calcium sulphide and of manganese sulphide in a series of slag mixtures.

Typical blast-furnace slag has been shown to consist essentially of the three minerals anorthite ($CaO.Al_2O_3.2SiO_2$), calcium bisilicate ($CaO.SiO_2$) and gehlenite ($2CaO.Al_2O_3.SiO_2$). First the solubility of the two sulphides was determined in each of these three compounds throughout a range of temperature from the melting points up to 1,600° C. Then, by aid of the tri-axial diagrams of Rankin and Wright, new diagrams were prepared showing the solubility of the sulphides in any mixture of the three minerals — that is to say, in any ordinary blast-furnace slag.

There are two outstanding results of this investigation, which confirm and explain the observations and conclusions of furnace operators. First, at any definite temperature the slags of highest alumina content will dissolve most calcium sulphide, while those low in alumina will dissolve more manganese sulphide. "Because of the much greater solubility of sulphur when it is in the form of manganese sulphide than when calcium sulphide, it would be desirable to cause reactions forming manganese sulphide to take place in the blast-furnace. At the present time, however, the factors controlling this reaction are not known, but an attractive field for research to determine them is opened up." The tables given in the paper show that, particularly at high temperatures, manganese sulphide is more soluble than iron sulphide, reaching 90 per cent. and more of its weight in the slag at 1,600° C.

The second important point demonstrated by the experiments is that the solubility of the sulphides in slag of any composition increases rapidly with increased

temperature. For instance, "if the temperature of the slag is increased from 1,400° to 1,600° C., the solubility of calcium sulphide is increased about three times and the solubility of the manganese sulphide is increased about six times. The temperature is a much more important factor than the chemical composition in effecting the solubility of sulphur in the slag."

The practical importance of these considerations needs only to be mentioned to be realized by those familiar with the operation of the blast-furnace. If a comparatively small rise in the temperature in the hearth will allow the use of coke and ore higher in sulphur than than that at present used, the reduction in the cost thus attained might more than pay for the cost of the extra heat. It is practicable to attain to this higher temperature only by one means—an oxygenated blast. In this connection it is of interest to note the report from the United States Bureau of Mines, noticed on another page, which concludes that oxygen by the ton at a price that makes it available for purposes such as this is probable in the near future.

There is also the possibility of using oxygen from the electrolytic reduction of iron from ore to enrich the blast. A combined electrolytic and blast-furnace plant might prove to be an interesting and lucrative venture. The blast enriched with oxygen would give a gas of a much higher value for power purposes at the top of the furnace. This would augment greatly the present surplus of power available from blast-furnace gas, a large part of which might be made available as electric power via the gas engine. This cheap electric power could then be used advantageously to separate iron ore into its component parts, pure iron and oxygen. Thus the production of electrolytic iron would aid the operation of the blast-furnace, instead of competing with it.

This research of Messrs. McCaffery and Oesterle opens up some most interesting avenues, some leading to further research and others to improvements in and additions to the blast-furnace practice. It, as well as the preceding studies upon which it is based, are worth the closest attention of Canadian blast-furnace men.

THE PUBLIC PAYS THE PIPER

Once more the public will pay the cost of a strike settlement. The anthracite operators of the United States and the Union leaders have agreed upon a ten per cent. increase in wages and the universal adoption of the eight-hour day. Thus those in Canada who wish to heat their houses during the coming winter with Pennsylvania anthracite will find plenty of it available—at an enhanced price.

Already coal dealers in Canada have made it known that the addition to the miners' wages and the subtraction from their hours of labour will be charged up to their customers. Governor Pinchot, whose plan of compromise has settled the strike, states that he hopes to conduct a public investigation whereby a reduction in freight rates and in the profits of wholesalers, brokers, jobbers and retailers will absorb the difference. We are not hopeful of his success in this direction; and at any rate, it could have little effect in this country, where another set of "coal barons" hold sway.

It is a noteworthy fact that the chief provisions of Governor Pinchot's proposal, now accepted, involve added costs of mining, which can be passed on readily to the public. The operators have continued steadfastly in their refusal to allow the "check-off", which they consider, no doubt rightly, would put them hopelessly in the power of the labour union.

The lesson for us Canadians is plain to read. There are alternative sources of domestic fuel available to the householders of central Canada. We must see to it that they are developed to the utmost. The efficacy of fuel controllers and public boards in controlling prices is limited and their awards are not final, as we have seen recently. We have also seen lately that competition in supply is the surest and best means of reducing prices to a reasonable figure. If each and all will examine shrewdly the alternatives to American hard coal and will purchase the best and cheapest fuel, we shall cease soon to pay our present huge annual tribute to those who provide us with Pennsylvania anthracite.

IRON ORE SUPPLY

Iron ore mining at Wabana in Newfoundland was curtailed seriously last week. Last year an outlet for 600,000 tons of ore during 1923 was arranged with German companies in the Ruhr district. Most of the furnaces there are now out of blast and the orders have been cancelled. A limited number of cargoes are being shipped to Philadelphia, and a few cargoes have been contracted for in England, where it is hoped there may be found a good market for the ore of Wabana. Meantime there is distressing unemployment among the iron ore miners of our sister Dominion.

In Ontario we find a different phase of the same problem. The vast deposits of iron ore that have been investigated to date are not acceptable to the furnace managers in their natural state, and the attempts to beneficiate them, though technically feasible, have been commercially unsuccessful. So close to success have two of the attempts come, however, that they are sure to be put to use within a short term of years. The report of the Committee on Iron Ore, appointed a year ago by the Ontario Government has not yet been made public officially; but it is understood to include a recommendation that a bounty be paid to the miners of native iron ore to help them "over the hump", with a view to independent and profitable operation when the bounty shall have expired. When this has been effected, Ontario, like Newfoundland, will find herself in possession of merchantable iron ore much in excess of the markets available, and the

province's present case of utter dependence upon imported ore will be altered to a capacity to export ore limited only by the opportunities for its sale.

Reports of the iron ore survey in progress in British Columbia indicate that there, too, the problem is to find a market. Much of the ore is of good quality, is readily accessible both for mining and for transportation and is held by owners anxious to dispose of it at reasonable rates. The only problem of consequence is as to whether the small and scattered population of the province, added to its opportunities for the export of iron and steel, warrants the erection of a modern iron and steel plant.

In Alberta, on the other hand, there is as yet no discovered iron ore. It is up to the prospector to find adequate supplies of this basic industrial material in that part of Canada whose fuel resources, it is confidently stated, will make it eventually the industrial centre of the Dominion. We cannot predict what the prospector will find; we can only hope.

The time is not far distant when, on the Pacific coast and on the Great Lakes, Canada's supply of iron and steel will be derived from her own ore. Though Newfoundland has not found it expedient to join our confederation, she will, doubtless, always make the Wabana ore available on preferred terms to the owners in Nova Scotia. Thus the outlook for the supply of iron ore for Canadian furnaces is bright, if we look well ahead. The increase of population on the Pacific coast soon will warrant the establishment of an iron and steel plant. By hook or by crook (signifying in this case a bounty) we must establish firmly the use of beneficiated ore in Ontario. The difficulties besetting the iron and steel industry in Nova Scotia (mainly financial and managerial) are being overcome rapidly by the present consolidated control, and the future is more promising than ever before.

AN APPALLING DISASTER

The fearful earthquake disaster that has overtaken the Tokio and Yokohama district of Japan is not only appalling in its tragic and terrible character, but also bewildering in its magnitude. At this writing, the death list is placed at over 300,000.

Numberless persons are homeless and destitute and terror, disorder and misery are rampant on every side. To this greatest disaster in the history of the world a typhoon contributed the final touch of horror. Missionary circles in Canada, as in other countries, are naturally plunged in the deepest concern and dismay, as a larger number of missionaries were known to be stationed in the regions affected.

This terrible disaster has called forth the world's sympathy for Japan in literally unstinted measure. Already help of the most practical kind is being given to the afflicted country, and there looks no doubt that whatever material assistance can be subsequently rendered in repairing the damage wrought by the holocaust, so far as it is capable of being repaired, will be freely and gladly given. But it seems undoubted that so sudden and so heavy a blow must mean a substantial check to the progress and prosperity of Japan.

The world at large is getting to know a good deal more about Japan than it used to do, and with knowledge have come increased and increasing understanding and appreciation. The Japanese are the most patriotic of peoples, and it is this patriotism of theirs that has, before now, brought them steadfastness and unity in times of storm and stress. The war with Russia first disclosed their possession of naval and military genius of a high order. They are at once skilful as strategists and courageous as combatants. And it would ill become those who dwell in any part of the British Empire to be forgetful of their fidelity to their friendship with Great Britain during the Great War. They are a kindly, helpful, hospitable, industrious and highly intelligent people — a people who are bound to occupy a position of increasing influence and importance among the nations of the earth. In days to come, one may be sure, they will not forget the sympathy and help extended to them in their present hour of national calamity.

RESEARCH AND WAR'S BURDENS

In order to maintain current standards of living and culture in the face of burdens left by the war, it is imperative that industrial development in future be definitely assured. Since manufacturing advances are won by the introduction into industry of new knowledge, it follows that new knowledge must be systematically sought, and that a portion of the product of industry must be set aside for pursuing the means of further progress.

On the personal side, it calls no less for the proper technical and social education of all grades of workers, together with the fullest utilization of their powers in modern administrative systems affording the most effective co-ordination of personnel.

The organization necessary to meet the two requirements thus broadly distinguished as research and education will be an integral part of the newer type of industrial administration, and the exercise of these functions will provide solutions to many pressing industrial problems. — From "Research in Industry," by Fleming & Pearce.

GOLD IN TANGANYIKA

One of the administrative officials of Tanganyika Territory recently described the minerals of this former German colony before the Royal Colonial Institute in London. Prominent among these is gold, found in quartz veins in the Mwanga district, southeast of Victoria Nyanza. The Germans had succeeded in developing one paying mine there, in spite of the isolated situation, and others were in the prospect stage. It is expected that the area will become an important producer of gold.

Canadian Mining Men

D. H. MacDougall

Donald Hugh MacDougall, Vice President of the British Empire Steel Corporation, was born in Cape Breton in 1879. He attended the public schools until he was thirteen and left then to begin work. He continued to study, however, and attended the Government Mining Schools. He took courses in the International Correspondence Schools and the Dalhousie Summer School (Mining Course). For a year or so he was an apprentice mechanic. He became, in turn, Assistant Mine and Railway Surveyor; Mine Surveyor; Mining Engineer; Civil Engineer and Engineer in charge of Construction, for the Dominion Iron and Steel Company.

Mr. D. H. MACDOUGALL

From 1902 to 1904 he was Assistant Resident Engineer on the New York Central and Hudson River Railway; from 1904 to 1907, Manager of the Wabana Iron Ore Mines, Newfoundland; in 1907, Superintendent of Mines and Quarries, Dominion Iron & Steel Company. In 1910 he was made Assistant General Manager of the Dominion Coal Company, becoming General Manager two years later. In 1916 he was appointed General Manager of the Dominion Iron & Steel Company.

In 1918 Mr. MacDougall became President of the Nova Scotia Steel & Coal Company; and when two years later the British Empire Steel Corporation was organized he was elected Vice-President. This was a fitting recognition of his efforts in bringing together into one organization the two largest companies of the Province, whose interests were being injured by separate management and whose whole future was jeopardized by boundary disputes. A wide experience gained in the Wabana iron ore mines and in the coal mines of both companies had taught Mr. MacDougall the utter folly of continuing to operate two large concerns on the same properties, so divided that access could be attained separately only by enormous expenditures. After all was said and done, outputs were low, costs were high, and a critical and dissatisfied public hurled deadly shafts of censure against the unbusiness-like methods of the two large companies. His keen eye was quick to see that waste must be eliminated and economy practised everywhere if success was to be attained. Temporary policies of operating the mines, both ore and coal, must be superseded by far-sighted business methods, with plans for the distant future, and not merely for a day. Great industrial problems confronted the coal industry, which would be reflected in the steel trade and required the leadership of great minds. The first thing to be done was to consolidate the two companies, meet the problem squarely, and then bend all the combined energies and resources on a solution.

Once this was agreed to (and Mr. MacDougall played a large part in bringing the warring factions into accord), the work of organization speedily followed. To appraise the values of the Wabana ore mines and of the plants and collieries of the Dominion and Scotia companies was not a difficult task. The ore deposits of Wabana and the coal seams of Cape Breton had never been fully valued, much less the Acadia coal field in Pictou county with their phenomenally thick seams. Now their value has been greatly enhanced under the care of a Corporation able to employ the best mining engineers and ready to provide the best colliery equipment and facilities for transportation to markets, near or far.

While doing his part in this great work, Mr. MacDougall has not neglected the other activities of a well-rounded life. He is a good friend, a good neighbor and a good citizen, as well as one of the leaders in his profession in Canada.

THE JOHNS-MANVILLE ASBESTOS FACTORY

One of the important industrial developments of the day is the establishment by the Canadian Johns-Manville Co., Limited, of a plant for the manufacture in Canada of asbestos products. The undertaking is of special interest because it represents a new venture in the manufacture of asbestos products on a large scale in Canada.

The plant is being erected at Asbestos, Quebec, right where the asbestos is being mined. This will help materially in keeping down costs, since freight charges will be eliminated and the savings effected should prove beneficial to the Canadian consumer.

At present two buildings are being constructed. These are one-story concrete and steel structures, 1,000 x 150 feet, and costing approximately $250,000. It is expected they will be completed and ready for use in time to admit of delivery of manufactured products on or before January 1.

The following lines will be turned out: asbestos roofings, shingles, packings, building materials of all kinds, insulation, paper and millboard, brake linings, etc. The initial installation will be sufficient to take care of all Canadian requirements.

Natural Gas and Petroleum Resources of Western Canada

The Recovery of Natural Gasoline by the Compression and Oil Absorption Methods

By NEWTON W. EMMENS

Transmission of Natural Gas for Heating and Power

From what work has actually been done, and from the knowledge we have of the geological formation and structure, it can be stated that in east central Alberta and in northwest Alberta there are natural gas resources that can be made of great utility and commercial importance to both the Province of Alberta and the Dominion, provided this gas be utilized and is not either shut in the ground or wasted in the air. It is admitted, of course, that the ideal way to utilize natural gas is for domestic heating, lighting and cooking, and as a fuel in the development of power for manufacturing plants, or as the motive power, when used in gas engines, for the same purpose. Before gas can be thus utilized, however, there must exist both the population and the manufacturing plants within a reasonable distance of the gas field to consume sufficient gas and pay a price high enough to warrant the operation of the field and the investment requisite to the laying of the pipe-line from the field to the centre of population.

What constitutes a reasonable distance from the field to the place where the gas is to be used depends upon the quantity of gas used daily and the pressure of the gas at the field end of the pipe-line. If the distance be 100 miles and the pipe be 8 inches in diameter with a pressure of 200 pounds per square inch at the field end, it would deliver 4,273,000 cubic feet of gas per day at the other end against a pressure in the distributing mains of 5 pounds, or 4,217,000 cubic feet against a pressure of 25 pounds. If the pressure were 100 pounds per square inch at the field end of the line the amount delivered would be 2,261,000 cubic feet per day against 5 pounds pressure and 2,185,000 cubic feet against 20 pounds. If this pipe line were 6 inches instead of 8 inches the quantity of gas delivered at the end of the 100 miles would be 2,050,000 cubic feet per day with a 200 pound pressure at the field end of the line and 5 pounds at the discharge end, and only 1,084,000 if the pressure were reduced to 100 pounds at the field end.

Size of Community Required

The quantity of gas used by the average consumer is 80 cubic feet per day (Indianapolis, U. S. A.) to 200 cubic feet (Kansas City). The amount of natural gas required for manufacturing is:—

Brick-making — 15,600 cubic feet per thousand brick.

Generation of electricity with steam installation using the gas as fuel under the boilers, takes 40 cubic feet per kilowatt hour. If an efficient type of gas engine is used to drive the generator it will take about 18 feet per kilowatt hour.

Steam engines, where the gas is used as fuel under the boilers, will take more or less gas according to the efficiency of the engine. A triple expansion condensing engine requires 16 cubic feet per horsepower-hour, while a single cylinder, cut-off engine requires 40 cubic feet per horsepower-hour.

A gas engine of the most efficient type requires 9 cubic feet per horsepower-hour, while a small ordinary gas engine will take 13 cubic feet per horsepower-hour.

If we take these figures and assume that the average amount of gas consumed for heating, lighting and cooking is 150 feet per day (which is high) throughout the year for each consumer, that is per family, in some Alberta town, and if we assume that this same town develops 2,000 horsepower for twelve hours each day for its factories, and 10,000 kilowatt-hours of electricity, it will require 22,000 consumers, or a population of over 100,000 to take care of the 4,273,000 cubic feet of gas.

A gas well having an open flow of 5,000,000 cubic feet of gas per day, with a closed rock pressure of 500 pounds per square inch, will deliver into a pipe line against a pressure of 200 pounds 2,915,000 cubic feet per day, so that two such wells would supply the gas required for our supposed town. If the wells only had a closed pressure of 300 pounds and an open flow of 2,000,000 cubic feet it would take eleven wells, which is a small number for a gas field.

The Uses for Alberta Gas

In that part the Province of Alberta referred to in a former article (C. M. J. August 24th, p. 665) there are four gas fields where development has proceeded far enough to assure a large supply of gas and to call for the consideration of its utilization. These are the Peace River, Pelican, Viking and Irma-Wainwright fields, of which only the Viking field is within reasonable distance of a city of sufficient size to warrant the capital expenditure in laying a gas line and supplying gas to it. This is the city of Edmonton and a pipe line is now being laid from the Viking field, a distance of 78 miles.

There is no town of any size within a radius of 100 miles of the Peace River, Pelican or Irma-Wainwright fields and there is no market for the gas as such. If, therefore, the gas is to be utilized and some return made to those who expend their capital in the developing of the fields, it is necessary to utilize the gas by manufacturing from it commodities that are necessary in the commercial activities of the nation and for which there is a continuous demand. Chief among these are gasoline and carbon-black.

What natural gas is and how gasoline occurs in it were explained in my last article (C. M. J. August 24th, pp. 665-667). I propose now to describe the several processes for its commercial recovery, leaving the matter of carbon-black manufacture from natural gas and its uses in the arts for another time.

Recovery of Gasoline by Compression of Gas

The first commercial use of gasoline obtained from natural gas appears to have been in the year 1904, when operators near Titusville, Pennsylvania, collected the condensate from their gas mains and sold it for use in gasoline engines. In 1905 the yield of gasoline thus obtained was increased by chilling the pipes carrying the gas with water, and experiments were commenced to develop some mechanical process whereby this gasoline could be extracted from the gas at the wells, before it entered the pipe lines. These experiments were successful and between 1905 and 1909 several plants were erected in the oil fields to recover the gasoline from the

rich casing-head gas by means of single stage, low pressure compressors. Since that time many improvements have been made in the methods of recovery by compression and the percentage of recovery has been increased greatly.

Prior to 1904 the liquid that condensed in the gas pipe-lines and accumulated in the low places was regarded as a nuisance, because it interfered with the steady flow of the gas, and because it necessitated the employment of men to go over the lines at intervals and drain this condensate from the low places, thus adding to the expense of operation. No one then realized that in a few years' time this liquid would become an important article of commerce and would add millions of dollars to the income of the natural gas producers throughout the country.

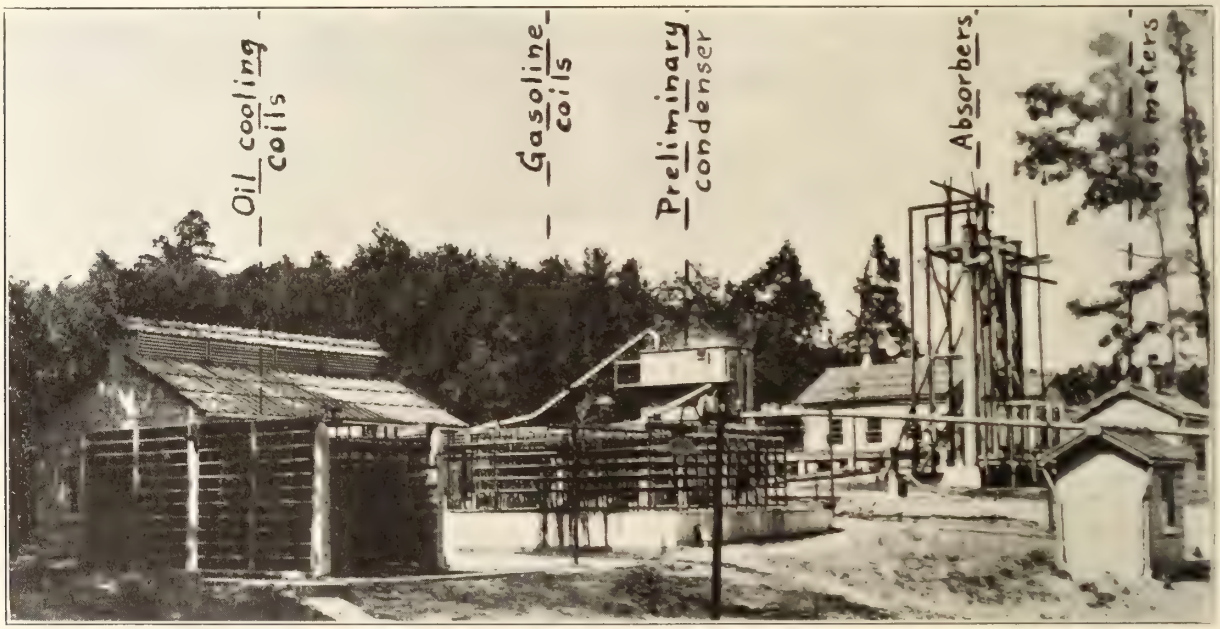
Laws Governing the Operation

The theory of the precipitation of gasoline vapors from natural gas may be compared with that of the precipitation of moisture from the atmosphere. Water vapor exists in the air at all times, in varying proportions, but is invisible unless condensed by cooling. Cooling alone, unless carried to an extremely low point, does not extract all the moisture from air, but if we take this cooled air and compress it, so as to reduce its volume several fold, we can extract another part of the water from it. It is seen, therefore, that we can extract water from the air either by cooling it or by compressing it, and if we use a combination of these processes we can make the maximum extraction.

The condensable vapors in natural gas are invisible under ordinary conditions, but at times the sudden release of natural gas under high pressure into the atmosphere will cause these vapors to condense and form a mist or fog, due to the sudden drop in temperature caused by the expansion of the gas.

In the extraction of gasoline from natural gas the desired result could be obtained either by reduction of pressure or by cooling, if it were not for the complex mixture of the gases, each of which has a different liquefaction temperature and pressure. Consequently without an exact knowledge of the proportion of each member constituting the gas to be treated any attempt to calculate the most suitable pressures or temperatures to precipitate them is little better than a guess, and the only practical method of arriving at the desired information is by actual tests and experiments.

According to the law of partial pressures, a gas containing 10 per cent of condensable vapor and under a pressure of 100 pounds would have acting upon the condensable portion a pressure of only 10 pounds, or 10 per cent of the total pressure. As the proportion of the condensable vapor in the gas becomes less through condensation, the partial pressure acting upon the remainder also becomes less until the point is reached where such pressure is too small to cause any further precipitation, thus leaving a part of the condensable vapors still in the gas. If, however, at the same time that the gas is being compressed its temperature be lowered by cooling, more of the vapors will be condensed and a higher percentage of recovery made. If the pressure be carried high enough and the compressed gas be cooled sufficiently it is possible to liquify, not only the vapors but every part of the gas; but such pressures and temperatures are not commercially practical, as the machinery required to attain them would be too expensive to install and operate. Commercial considerations, therefore, require that the pressures and temperatures employed be such as can be obtained by the use of standard machines, pipes and fittings, which will recover the largest possible amount of condensate that will conform to the standards of safety and make a good motor fuel.



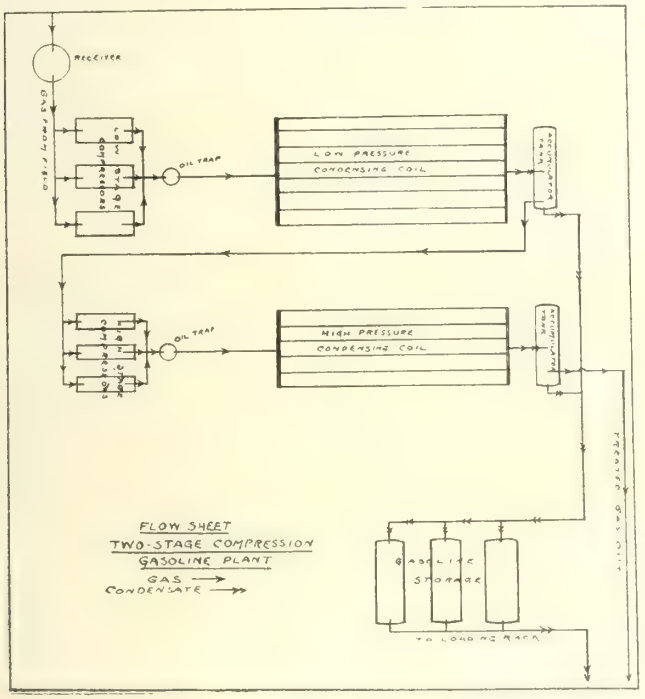
Oil Absorption Plant for Natural Gas

Portable Experimental Plant

Not only is the natural gas from each field of a different analysis, but the gas from each producing sand, and often from each individual well, contains a different proportion of the several hydrocarbon gases. It is necessary, therefore, to test the gas under different pressures and temperatures with an apparatus that as nearly as possible duplicates the proposed plant operations and conditions, in order to obtain the requisite data upon which to design the plant. The first step in the process is to measure and test the gas from each well by means of a small portable apparatus, to arrive at the approximate gasoline content of the gas and to eliminate such wells as do not give off gas containing over one gallon of gasoline per thousand cubic feet. Having decided that there is a sufficient volume of gas rich enough in gasoline content to make its recovery

by the compression method a commercially profitable undertaking, the next step is to carry out the compression and cooling tests of the gas to be passed through the plant. The apparatus used in making these tests consists of a 10-horsepower gas engine, a small two-stage compressor, coils for cooling the compressed gas and condensing the gasoline, a tank for separating the condensate from the residue gas, two meters, one to measure the gas it comes from the field and the other to measure the gas after the gasoline is removed, and the various valves, connections, pressure gauges, safety valves, expansion valves, etc., necessary to connect the different parts of the equipment. The whole of this apparatus is mounted on a wheeled truck that can be hauled from place to place.

In making the test several measured quantities of gas are passed through at pressures up to 300 pounds per square inch, and the gasoline obtained carefully measured and its specific gravity taken after each run. Great care must be observed in taking the several read-



ings because of the small amount of gas handled at each test. Any error in observation or calculation when making the tests would be greatly magnified when applied to a plant operating on a commercial scale. It is inadvisable to make a condensate having a specific gravity of over 90 degrees Baumé, because of its excessive volatility, and an allowance of 25 per cent should be made for vaporization losses between the amount of liquid as shown by the tests and what will be actually marketed from the big plant.

The Compression Plant

A typical compression plant consists of two-stage gas compressors either direct connected to the gas engines that operate them or driven by independent gas engines with belt-drive, cooling coils, accumulator tanks, oil traps, storage tanks, blending tanks, water circulating pumps, valves, pipe-lines, fittings, gauges, and regulating devices, complete electric lighting system, steam heating system for entire plant, chemical fire-fighting equipment, with all necessary buildings. In addition, in places that are remote from centres of population, such as in central and northern Alberta, a well fitted pipe, machine, and blacksmith shop would have to be provided where all necessary repairs could be made. From the storage tanks a pipe-line is laid to the railway siding where the loading-rack is built and where the gasoline is loaded into tank cars for shipment.

The operation of the plant (see Fig. 1.) is as follows: The gas as it comes in from the field passes through a receiver where any dirt, water or oil being mechanically carried along by the fast moving gas in the pipe-line can settle. From the receiver the gas passes to the suction side of the low-stage compressor and is raised to a pressure of from 40 to 80 pounds. The discharge from this low-stage machine passes through an oil trap, where any oil that may have been taken up by the gas from the compression cylinder is separated, thence to a set of cooling coils where the first condensation takes place.

The gas then returns to the intake side of the high-pressure machine and is compressed up to 200 to 300 pounds. From here it passes through another oil trap and then on to the high-pressure condensing coils where the balance of the condensable vapors are precipitated, after which the gas goes into the pipe lines that lead it away.

The gasoline condensed in the low and high-pressure coils goes to the accumulator tanks, where any water that may have separated from the gas is collected and run off. From the accumulator tanks the gasoline goes to the storage tanks, or if its gravity be too high it is sent to the blending tank where enough naphtha is added to it to bring its gravity down to the required point. The cooling coils are cooled by a water spray that is kept continually playing on them, the cooling effect of which is increased by the evaporation of the water on the coils.

Treatment of Gas by Oil Absorption

The compression system of recovering gasoline from natural gas was originally considered to be efficient; but recent investigations have disclosed the fact that the percentage of extraction is quite low and that the residual gas contains from three-tenths to as high as eight-tenths gallons per thousand cubic feet, the recoveries being from 70 to 80 per cent on gas containing from 2 to 10 gallons of gasoline per thousand cubic feet. This system is applicable only to gas containing over one gallon of gasoline per thousand cubic feet.

There are a great many millions of cubic feet of natural gas produced daily that do not contain a sufficient amount of gasoline to make their treatment by the compression method commercially profitable. Investigations and experiments were carried out, therefore, to devise some process by which this could be done, taking as a basis the methods used in the recovery of benzol, toluol, and other products made from the distillation of coal, which consists essentially in causing the gas to pass through some medium that has the property of absorbing those portions it is desired to recover, which in the case of natural gas is the gasoline hydrocarbons.

Original Plant in West Virginia

In 1911 an experimental plant was erected at Hastings, West Virginia, and in 1913 the first large scale plant was put in operation at that place, under the direction of G. M. Saybolt, (by whom the process was patented), to recover the gasoline from the natural gas being furnished to the city of Pittsburgh, Pa., from the West Virginia fields. The process used consisted in causing the natural gas to bubble up through a petroleum distillate with a gravity of about 35 degrees Baumé, at a high pressure. The charged distillate then was

sent to a still where the absorbed gasoline was driven off and condensed, and the oil used over again. Since that time numerous improvements have been made in the details of the process, though the principal involved remains the same.

In this connection it is interesting to note that Saybolt is not the originator of the idea of recovering hydrocarbon vapors by absorbing them in oil, even though he was the first to put it into commercial operation. In 1875 a patent was granted to an Englishman named William Young, covering the process of absorbing the hydrocarbon vapors contained in gas by passing it counter current to oil and then distilling the charged oil to recover these absorbed vapors, and the apparatus described in that patent is very similar to that in use today, while the process described is identical. Unfortunately for Mr. Young he was before his time and before the days of the gasoline engine.

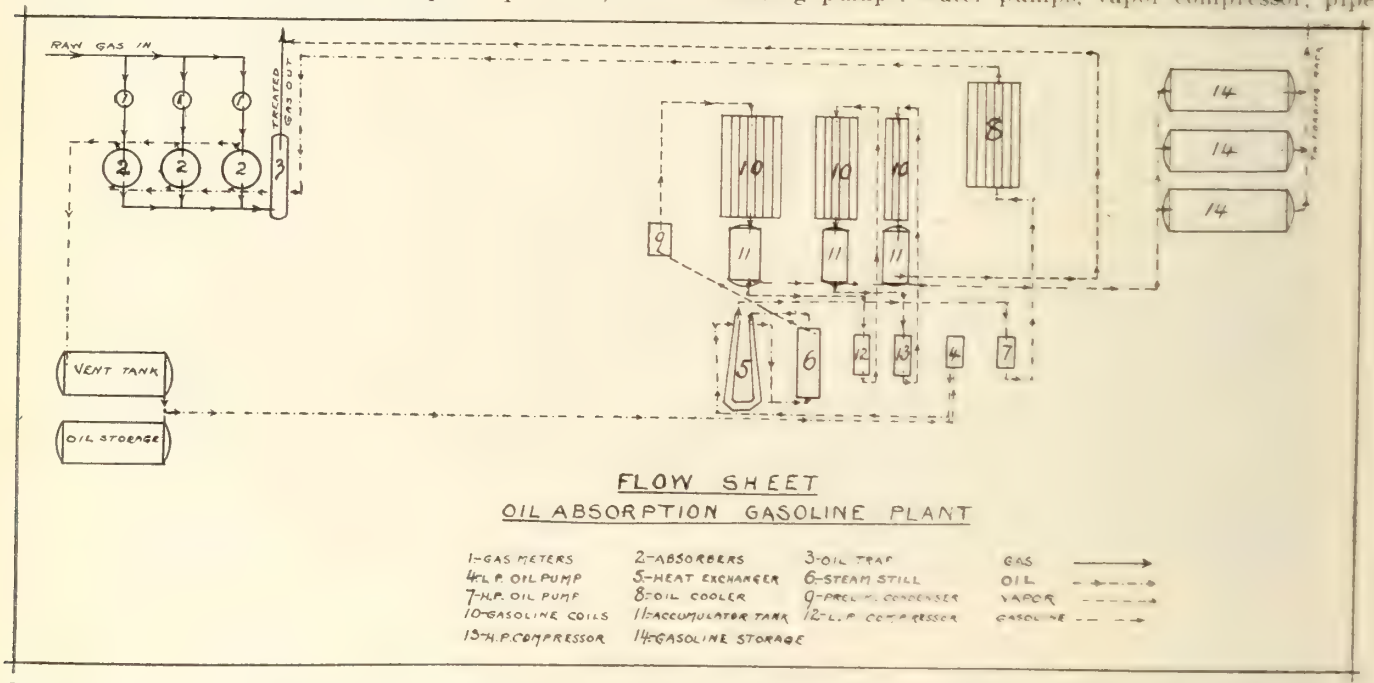
Natural gas follows Henry's law of gases, which states "The weight of any gas absorbed in the unit volume of liquid, at any pressure, will be equal to the weight absorbed in that volume at one atmosphere pressure, times that pressure (in atmospheres)". This law, together with that of partial pressures previously referred to, has an important bearing on the absorption process and its operation, but cannot be applied mathematically to plant designing, except in a very general way, because it is impossible to learn by any known method the percentages of the different hydrocarbons that constitute the gas, and therefore the pressure, temperature, and oil circulation per thousand cubic feet of gas that will yield the maximum commercial results. Such being the case, it is highly desirable that tests be made of the gas to be treated as nearly as possible under plant conditions, using the same absorption medium and making a series of runs at different pressures, with careful observations of the temperatures.

Experimental Plant for Tests

The apparatus used in making such tests consists of a small gas-compressor and engine to drive it, cooling coils to remove the heat of compression from the gas, gas-meter, and the absorber in which the gas is brought into intimate contact with the absorption medium, usually mineral seal oil, having a gravity of 35 to 40 degrees Baumé. The absorber consists of five absorption chambers connected in series, in each of which a definite amount of absorption oil is placed — usually 2,700 c.c. A measured quantity of the gas to be tested is passed through the apparatus at speeds varying from 20 to 400 feet per hour, depending upon the pressure at which the test is being made, — the higher the pressure the greater the permissible speed of the gas, the pressure depending upon the estimated gasoline content of the gas as determined by a preliminary examination. After the run the oil is drawn off from the absorption chambers and distilled, and from the gasoline recovered the content of the gas is arrived at. By making a series of tests under varying pressure, temperature and oil circulation conditions, the data are obtained upon which to design the full size plant in order to obtain the maximum commercial recovery.

Oil Absorption Plant

The large plant (see Fig. 2) consists of meters for measuring the gas, absorbers, heat exchangers, still, cooling coil, condensing coils, accumulator tanks, oil storage tank, vent tank, gasoline storage tanks, oil circulating pumps, water pumps, vapor compressor, pipes and connections, valves, and regulating devices. In addition there are the steam boilers, electric-light generating plant, pipe-fitting and work shop, laboratory, chemical fire extinguishers, and buildings to house the machinery. In some plants, where the field gas pressure is not high enough, there are added gas compressors.



The operation of the plant is as follows: The gas as it comes from the field passes through the meters, thence through the absorbers, from there to an expansion tank or oil trap to recover any absorption oil that may have been carried over mechanically by the gas, and then on to the discharge line out of the plant. In passing through the absorbers the gas enters at the bottom and out at the top. The absorbing oil is pumped from the still through the heat exchanger and the cooling coils into the top of the absorbers, out at the bottom, into the vent tank, whence it goes to the still and then commences the cycle again. In passing through the absorber from top to bottom the oil comes in contact with the gas going in the other direction, and takes up any gasoline vapors it may contain. In the vent tank the oil is allowed to settle for a short time, allowing it to give up any gas or light hydrocarbon fractions that

may have been carried over with it and that cannot be condensed. From the vent tank the charged oil passes through the heat exchanger, counter current to the hot distilled oil coming from the still, absorbing from the latter a considerable proportion of its heat, and then on to the still where its temperature is raised to about 210 deg. F. by means of steam and the gasoline driven off in the form of heated vapor. The oil, after having its burden of gasoline removed, goes through the heat exchanger, as already stated, and to the cooling coils where its temperature is reduced by means of a water spray playing on the outside of the coils, and from there to the absorbers again for a fresh charge of gasoline.

The vapor from the still goes first to a preliminary condenser where its temperature is reduced to 185 deg. F. and where any water or oil vapors it may contain are separated out. From here it goes to a set of water-cooled coils where the bulk of the gasoline is condensed at atmospheric pressure. All the gasoline hydrocarbons are not, however condensed in this first cooling coil (due to the law of partial pressure as previously explained), so the uncondensed vapors are taken to the vapor-compressor where they are raised to a pressure of 50 pounds per square inch, thence to a second set of cooling coils, where they give up another lot of gasoline, whence they return to the high side of the vapor-compressor and are compressed to a pressure of 250 pounds per square inch. After this final compressing they are again cooled in a third set of coils, and the balance of the liquifiable hydrocarbons recovered. Any vapors still remaining uncondensed are led off and mixed with the treated gas from the absorbers.

The gasoline recovered from each set of cooling coils differs greatly in both its gravity and quantity. The first set of coils yields a gasoline with a gravity of 72 deg. to 80 deg. B. and comprises from 50 to 70 per cent of the plant's output. The second set of coils gives a gasoline of 80 deg. to 90 deg. B. comprising 10 to 30 per cent of the output, and that from the last set of coils has a gravity of 85 deg. to 95 deg. B. and constitutes the balance of the plant's output. Owing to the high gravity and extreme volatility of this last gasoline it is good practice to mix it with low gravity naphtha and thus avoid excessive losses by volatilization in the storage tanks. It is also good policy to maintain a pressure of from 5 to 10 pounds on the gasoline in the storage tanks for the same purpose.

In treating natural gas by the oil absorption method it is better to do so under comparatively high pressures because the oil saturation with gasoline vapors may be carried to a higher point, which means a lessened oil circulation per thousand cubic feet of gas treated and a smaller quantity of oil to be handled through the still and oil circulation system. The recoveries by this process in a properly designed and carefully operated plant are from 87 to 95 per cent on the gasoline contained in the gas.

The next article will describe the treatment of natural gas by the charcoal process.

DISPOSITION OF SOUTH AFRICAN GOLD

"The Times" London, points out that for the first half of 1923 South Africa's gold was sent, 60 per cent. to India, 25 per cent. to New York, and 14 per cent. to continental European purchasers. All this South African gold was sold in London, and though this is no longer required by law, it seems likely London will remain the sole market.

CHEAP OXYGEN FOR METALLURGICAL USES

Revolutionary changes in the metallurgy of iron by which production costs should be materially decreased and quantities of low-grade ore and smelting fuels now considered worthless be made available as the result of the use of oxygen and oxygenated air in blast furnace practice are suggested in a report just made by a committee appointed by the United States Bureau of Mines to study the problem.

In the past it has been necessary in the production of one ton of pig iron to pass three tons of inert nitrogen through the blast furnace, resulting in serious heat and metal losses. The elimination of such losses by the substitution of oxygen, or a mixture of oxygen and air, has long been considered, but has not been put into practice on account of the inability to produce oxygen in quantities at sufficiently low cost to make such application industrially possible.

In view of the many recent developments in oxygen manufacture, and considering the increasing cost and decreasing quality of the nation's' raw materials, the Bureau of Mines appointed an advisory committee to study the problem of the application of oxygen or oxygenated air to metallurgical and allied processes. M. H. Roberts, of New York, is chairman of the committee.

This committee has made a thorough survey of the existing processes for the manufacture of 99 per cent. oxygen. The conclusions reached are that the comparatively small demand for the product has prevented the installation of large units suitable for metallurgical processes, with corresponding economies, and that by far the greater proportion of the present cost of oxygen represents the cost of transportation, storage and service. Large oxygen manufacturing plants can be built to serve metallurgical purposes directly, which will be capable of delivering oxygen at a cost not to exceed $3 per gross ton. In brief, the committee finds that the oxygen industry is now able to make plants for supplying large quantities of oxygen to metallurgical industries at low cost.

The data collected by the Bureau of Mines committee indicate that the production and utilization of cheap oxygen should also accomplish great economies in the metallurgy of zinc. It is believed that similar economies can be effected in the metallurgy of copper, and in fact in all branches of non-ferrous metallurgy. Great possibilities are pointed out in the application of oxygen in the manufacture of artificial gas and for various other industrial uses. The findings of the committee on these theoretical studies are of such revolutionary character that the members feel the strong advisability of conducting experimental work to verify the truth thereof, as well as to make changes in furnace design and processes in order to take full advantage of the probable benefits to be gained.

The committee has developed plans for experimentally determining the effects of oxygen enriched air upon the operation of the blast furnace, and it is recommended that these plans be put into effect as the first step of an extended research as to the general applicability of oxygen to metallurgy.

The knowledge that German industrial concerns are working actively on the application of oxygenated air to metallurgical processes has greatly concerned American iron and steel interests, and the industry is making insistent demands for research work of this nature.

The findings of the committee have been incorporated in Serial 2502, "The use of oxygen or oxygenated air in metallurgical and allied processes," which may be obtained from the Department of the Interior, Bureau of Mines, Washington, D. C.

South Lorrain

Report By Cyril W. Knight on Geology and Mining Operations

The geologists of the Ontario Department of Mines are intimately involved in the practical working of the Province's mines. This fact is demonstrated clearly in the Department's latest geological report, "The South Lorrain Silver Area," by Cyril W. Knight (Bulletin No. 48), which was issued three weeks ago on the occasion of the tour of the mining camps by members of the A. I. M. M. E. It is a 55-page excerpt from the larger report on the Cobalt silver area.

The production area of South Lorrain, about 100 acres in extent as at present determined, lies to the north of Trout Lake, three miles west of Lake Temiskaming and 16 miles southeast of the town of Cobalt. Silver was first discovered in 1907 at the Keeley mine, which produced 24,337 ounces up to 1913, and then at the adjoining Wettlaufer mine, the only successful mine of the district up to that time, which yielded 2 1-2 million ounces. At the end of 1922 the total was 4,440,000 ounces.

Pioneers of the New South Lorrain

In 1913 Dr. J. Macintosh Bell took an option on the Keeley property, after an examination that convinced him he would find ore-shoots due to secondary enrichment in the Woods vein, which had been weathered and leached in pre-Glacial times. In spite of the difficulties imposed by the war and his own military service, Dr. Bell hung on, and in 1921 was rewarded by his first important discovery. The price paid for the property was $110,000.

Contemporaneously there was activity on the adjoining Frontier property, where early developments had disclosed a strong vein of smaltite. During 1919 and 1920 there was an active demand for cobalt ore, and in the latter year M. Horace F. Strong bought the Frontier on behalf of American clients and commenced mining smaltite. During the course of this mining he encountered some encouraging silver values, and after the Keeley strike was made in 1921, the property was sold to the Mining Corporation for $525,000. It may be noted, incidentally, that ore won from development during the two years over which payments were due has covered the cost of the property.

Occurrence of Veins

As South Lorrain is still a mining camp in the making, Mr. Knight's report has, quite properly, a forward outlook. He discusses first the occurrence of the known productive veins. These are principally in fault planes, along the top of a sill, with dome-like shape, of Nipissing diabase, and in the overlying rocks of Keewatin age. "In this respect the occurrence is similar to that at the Timiskaming and Beaver Mines at Cobalt. No ore has yet been found in the conglomerate and greywacké of the Cobalt series below the South Lorrain diabase dome. In Cobalt, on the other hand, the rocks below a similar dome, in the Kerr lake-Giroux lake section, have been highly productive, and such mines as the University, Lawson, Crown Reserve, Kerr Lake, and Drummond all occur below the diabase dome in rocks of the Cobalt series."

In the South Lorrain area faults are of prime importance, economically, as the productive veins occur in these. They are very numerous, and the fault system is complex. It is suggested that the numerous sharply defined valleys represent faults. There is some definite evidence for this at Loon Lake and on the Maidens property to the northeast, in the form of fault breccia cemented with calcite and other carbonates. Arguing by analogy, these are good places to prospect.

Discovery of Ore Bodies

"To those, and there are many, who want to know the likely places in which to explore in South Lorrain, the writer can do no better than to point out how success was achieved during the last two years at the Keeley and Frontier properties. The operators began working at the surface on strong calcite veins, an inch to a foot or more in diameter; these veins contained small shoots of smaltite; the silver was negligible. The veins outcropped in Keewatin rocks three to four hundred feet above the top of the Nipissing diabase sill. The operators sank on the veins to the contact of the Nippissing diabase and Keewatin basalt. Exploration of the veins along and near the contact revealed the rich ore-shoots which have brought the camp into such prominence. Another factor, however, besides the diabase contact played its part at the Keeley mine. J. Mackintosh Bell believed that, at or near the bottom of the pre-glacial weathered zone in Wood's vein, he would find rich masses of secondary silver ore which had been leached out of the top part of the vein. While the bottom of the weathered zone has not yet been reached at a depth of 480 feet, there is evidence nevertheless that the workings are approaching it. At any rate, most of the high-grade ore in the mine has been encountered at this depth.

"Those seeking new ore bodies in South Lorrain should also keep in mind the conglomerate and greywacké of the Cobalt series below the South Lorrain dome, in the vicinity of Loon and Oxbow lakes. Up to the present time no calcite veins of importance are known in these rocks under the dome. Should strong calcite veins, with smaltite, be discovered by trenching or diamond drilling such veins might be explored along the base of the Cobalt series. In Cobalt much of the silver ore occurs along the base of that series; similar conditions may exist in South Lorrain under the diabase dome."

This is "straight stuff!" Mr. Knight is to be congratulated on having provided, as a result of his studies, such clear and unequivocal directions for the guidance of practical miners.

Mine Maps Made Available for Public Use

The mine operators have made available to Mr. Knight for his use, the whole of their geological and mine records. Based on the excellent map of South Lorrain made in 1908-09 by Stewart, Bartlett and Burrows, the company maps give the intimate geological and topographical features of the mining properties. It may be noted in passing that the new maps of the Porcupine area now being made by Mr. A. G. Burrows is being compiled similarly from company maps, made available for public use, with the intervening spaces filled in.

The Diabase Sill

Most space is devoted by Mr. Knight, in his discussion of the area's geology, to the dome-like diabase sill whose intrusion caused the forming of the silver-bearing veins. The sheet of diabase, several hundreds of feet in thickness, dips to the north, to the west, and to the southeast and the top of the dome extends to the east shore of Lake Temiskaming, in the province of Quebec. Erosion has cut off the top of the dome, exposing its contact with

the underlying rocks, which are arkose and quartzite, greywacké and conglomerate of the Cobalt series. The evidence available goes to show that the sill was intruded in its present dome-like form, and that subsequent folding has altered its shape very little.

Secondary Enrichment

In regard to the much-discussed question of secondary enrichment, Mr. Knight has this to say:

"It is generally accepted that most of the native silver at Cobalt is primary.

"The primary character of all the silver at the Keeley mine, however, is to be doubted. Some of the silver which occurs in the weathered zone, described in preceding pages, is in all probability secondary, as was first pointed out by J. Mackintosh Bell. It would be difficult, nevertheless, to reach a definite conclusion as to what proportion of the silver in the Keeley mine is primary and what proportion is secondary.

"This much may be said: In the oxidized zone native silver in thin leaves has been found deposited on top of red iron oxides. These red iron oxides are secondary; and hence the leaf silver deposited on top of the oxides is also secondary. Very little native silver, however, occurring under this condition has been noted.

"Again, soft spongy layers of native silver were noted resting loosely on top of smaltite. The sponge silver could be removed with the nail. This silver is doubtless secondary, having been leached out of the upper greatly oxidized zone and precipitated when the silver solutions came in contact with the unaltered smaltite at depth. Little of such silver was noted.

"Probably the ruby silver occurring in geodes and vugs is also secondary. The wire silver, so common at the Keeley mine, is also doubtless secondary.

"Beyond these statements the writer is not prepared to go at the present time. An examination of many polished surfaces of the ore might lead to a more definite idea as to how much silver at the Keeley is primary and how much is secondary.

"More light may, perhaps, be thrown on this subject when mining operations have reached the bottom of the weathered zone....."

"The question has been asked the writer whether the weathered zone will extend south to Trout lake, a distance of about half a mile, and whether it will follow along the bottom of Trout lake a farther distance south of a mile. This can be answered only by exploration of the ground. It is very doubtful, however, if the weathering will persist unless the Wood's or some other fault extends south to Trout lake. The reason that pre-glacial weathering has been preserved is that it followed down Wood's fault along a narrow zone on each side of fault. Glaciation was not intense enough to remove the solid fresh rock on each side of the fault. Hence the preservation of the weathered zone in Wood's fault."

Suggested Importance of Fault Planes and Lamprophyre Dykes

An obvious tip from geologist to miner is contained in the discussion of No. 16 vein on the seventh level of the Keeley. "It is in Nipissing diabase for some distance west of Wood's vein. Where the vein occurs in the diabase it is vertical, but where it enters the Keewatin it dips at an angle of about 60 to the south. This southerly dip is due to the fact that where the vein enters the Keewatin it follows the footfall of a mica-lamprophyre dike and, as the dike dips to the southward at 60 deg., so the vein also has this dip. It is another instance, so common in the Cobalt area, of a vein following the strike and dip of a lamprophyre dike. In every case, of course, the lamprophyre dikes are younger than the Keewatin, but older than the Nipissing diabase. At the time of our examination in October 1922, vein No. 16 had been traced for 100 feet along the footwall of the lamprophyre dike. Vein No. 16 is a fault vein."

Again, in discussing this vein on the sixth level, where it produced 150,000 ounces from a shoot 30 feet by 25 feet, it is noted that "it follows a mica-lamprophyre dike, as on the seventh level." This is true also on the fifth level.

No. 1 vein on the Frontier, in which ten shoots of high-grade ore have been encountered, also displays a tendency to follow a lamprophyre dyke. Another rich vein, the Watson, is in a fault plane, associated with a lamprophyre dyke.

The Maidens underground workings were not available for inspection, being full of water; but Mr. Knight noticed on the dump that "some of the blocks of vein matter show rock fragments cemented with calcite, suggesting a fault plane," and that "blocks of lamprophyre were found on the dump."

This report is characteristic of the tendency among our economic geologists to present to the mining public data and conclusions that are clear and plainly stated, that are not burdened with scientific or pseudo-scientific theory, and that are written in the King's English.

MALAGASH SALT MILL REBUILT

The surface plant at the Malagash salt mine on Northumberland Strait in Nova Scotia, which was destroyed by fire in July, has been rebuilt, and after three and a half weeks' delay, the mine and mill are being operated again under much improved conditions.

The salt mined at present from the Malagash deposit is of unusually high grade, running over 9.9 per cent. sodium chloride and containing only a trace of magnesium chloride. It is the presence of magnesium chloride in salt that makes it hygroscopic, and thereby unsatisfactory for curing dried salt. Malagash salt has now been proved eminently suitable for fish curing, being equal to the best imported salt, which sells at $15.00 to $18.00 a ton, and also being available at the price of the inferior salts.

Malagash salt is also finding a ready market on account of another characteristic. Most of the brands of salt used on the Nova Scotia coasts have been shown to contain bacteria that cause a rusty or reddish colour in the cured fish. The Malagash product does not contain these bacteria, and so is preferred by the fishermen. Thus the Canadian product is rapidly making a substantial market for itself, and at the same time is helping to improve the quality of Nova Scotia salt fish.

GEOLOGICAL GUIDES TO GOLD VEINS

The country rocks near gold ore deposits are usually altered in a noticeable way, which must be studied in each district. Some of the changes are schisting, fracturing, rusty appearance from weathering disseminated pyrite, bleaching of dark rocks, the occurrence of calcite and other carbonates, and the appearance of minerals characteristic of contract metamorphism, such as garnet and epidote. Of these appearances, probably schisting and extensive mineralization with pyrite or the rusty capping resulting from its weathering, are the most useful guides to the prospector.

The Labrador Fizzle

By ALEXANDER GRAY

It is charitable to suppose that J. Lambert Payne, of Ottawa, an official of Labrador Goldfields, Ltd., was taking the sleepy dust out of his own eyes, instead of throwing something into the optics of the public, when he delivered himself of the following after receiving the report of W. Morley Ogilvie, who was sent to the alleged "Eldorado:"

"This is to me a bitter disappointment, I believed in the thing, and to the extent that I influenced some of my personal friends, I feel humiliated and discredited. This simply means, however, that I was deceived along with many others, and I am a loser as well as they.

"I have but one consolation. In all our advertising, we presented the proposition as an absolute gamble. No one could have been misled into the belief they were taking up a sure thing."

According to the daily papers, Mr. Ogilvie "found no gold" and "there is no gold as far as he can ascertain in the district.

Mr. Payne applies flattering unction to himself. Undoubtedly he and his associates (some of them) were deceived by stories that "a couple of men had visited Labrador and claimed to have made discoveries of gold, backing these up by alleged assays." After the display advertising (long after) describing the millions likely to be made out of the Labrador leases, it may be said of Mr. Payne that he awoke. Meanwhile 129 leases had been sold for about $25,800. Probably little of that became available for testing purposes. The advertising and canvassing, office expenses and incidentals of promoters, left little for field work.

When the froth was off, the vessel to convey the expedition to Labrador needed more than froth ballast. About that time, too, the President of Labrador Gold fields, Ltd., was ousted by Mr. Payne and others. Dr. Ledoux of New York also denounced the principals publicly as guilty of a palpable deception. Mr. Payne disclaims all responsibility for this. He admitted that he had been misled; but there was more than this in the matter when Dr. Ledoux told of how two tricksters faked a Ledoux & Company analysis, confessed their culpability and contritely (?) declared they never again would be guilty of doing such a thing!

Responsibility of Public Authorities

Manifestly a good deal of the Labrador propaganda was conceived in iniquity. The Newfoundland Government, by default, allowed promoters to acquire areas and dispose of shares. The Ledoux repudiation of a forged certificate evoked no official admonition. On the contrary, shareholders in one of the Labrador ventures reinstated in office culprits who should have been prosecuted.

One or two Labrador ventures were honestly conducted. They were based upon the representations of men who claimed to have panned gold over an extensive area. It was the Payne organization that displayed the "gamble." Mr. Payne sees the light. Whatever of the public's money has been squandered may serve to emphasize the fact that there was an open season of short duration for a few birds who should be punished. Newfoundland and Quebec authorities might make an example of those who sold leases and misrepresented Ledoux & Company.

As the *Canadian Mining Journal* was the first publication to warm governments and the public against the Labrador "gamble," it may now be permitted to suggest to Mr. Payne in these pages that he add corrective action to his admitted "humiliation and discredit."

Another Chapter Closed

The Montrealers who refrained from misrepresentation and who gave Labrador an honest try-out have decided to abandon the square miles they acquired on Big Brook and elsewhere. They made a sporting bet, and lost. They have nothing further to say, except that the prospectors' dream was a common or garden prevarication, or series of prevarications. All are agreed the placers are mythical and also that the Newfoundland Government cannot escape censure. Where pannings were said to have been obtained one, two and three years ago, there were no colors this year. Black sand was barren of values. It is surmised that the fabled nuggets, about which so much fuss was made, never came from Labrador. One Montreal laboratory was given a sample for assay; but it consisted of fragmentary quartz containing gold. It would have to be crushed and the gold recovered by the usual metallurgical processes.

The flimsiest yarns seem to have enabled crooked adventurers to sell leases as worthless as the words of those who uttered them. Practically all the prospectors have left Labrador. The members of the Montreal party on their return did not hesitate to denounce those responsible for the false representations. Newfoundland alone profited by the adventure; but the profit is dearly won. If Ottawa, Quebec and Newfoundland cannot find a means of punishing those who sold areas and shares, then the public may as well abandon all hope of redress. George Winston, a prospector, on arriving at Sydney, declared that he and a number of his fellows who paid out large sums of money for "gold" claims at Stag Bay and vicinity, would ask the Newfoundland Government to proceed against the heads of various corporations that sold claims. Furthermore, Winston asserts "there isn't enough gold in Stag Bay to cover a penny."

COPPER RESERVES IN KATANGA

At the annual meeting of the Union Minière in Brussels recently, it was disclosed that the company's mines in the Katanga, Belgian Congo, have 68,000,000 tons of ore in reserve, containing 4,500,000 tons of copper. The smelters made 43,362 tons of copper in 1922, against 30,464 tons in 1921. For the first six months of 1923 there was produced 24,500 tons of copper. A leaching plant is to be installed. In addition to copper, the company is treating successfully ores of tin, cobalt and radium.

LOW GOLD MINING COSTS

At the Shamoa mine in Southern Rhodesia gold ore containing 3½ dwt. per ton is treated for 9s. per ton. The ore is mined by means of adits. The plant consists of crushers, 64 Nissen stamps, twelve tube mills and sand and slime plants, cyanide solution being used throughout. The capacity is 30,000 tons a month.

The Hidden Creek Mine

Dr. Victor Dolmage Describes the Mine that keeps the Anyox Smelter Busy

Last summer Victor Dolmage, of the Geological Survey, Ottawa, mapped 200 miles of the coast of British Columbia, from Stewart southward, thus completing a survey of the coast commenced in 1905 by the late O. E. Leroy. An interim report is published in "Summary Report, 1922, Part A." The area includes the important mineral areas at Stewart, Alice Arm, Surf Inlet and Anyox. The following is, in part, Dr. Dolmage's description of the Hidden Creek Mine at Anyox:

Largest Copper Deposit in B. C.

The largest deposit of copper is that of the Hidden Creek mine at Anyox, owned and operated by the Granby Consolidated Mining, Smelting, and Power Company. This is the largest copper deposit in British Columbia and is at present producing nearly 3,000,000 pounds of copper per month. A very excellent and complete report on the deposit had, shortly before the writer's visit, been finished by J. Austen Bancroft, formerly assistant general manager of the company. This report, and the geological maps accompanying it, were kindly placed at the writer's disposal. With the help of these, and the observations made during several days on the premises under the guidance of F. E. Patton, the company's mining engineer, a good knowledge of the deposit was obtained. The following report is largely a restatement of facts from Bancroft's report, with a few observations by the writer.

The mine is situated about 1 mile north of Granby (formerly Goose) bay, on the west side of Observatory inlet justs at the junction of Hastings and Alice arms. A smelter with a daily capacity of 3,000 tons is situated on the shore of Granby bay. The ore, which is very high in sulphur, is smelted directly in blast furnaces by a process of partial pyritic smelting without previous roasting or concentrating. The matte from the blast furnaces is blown to blister copper in converters and the blister copper is shipped to the Nichols Chemical Company, New York, where it is refined.

Occurrence of the Ore

The ore-bodies are well to the centre of a large body of greenstones and metamorphosed argillaceous sediments which forms an inclusion in the Coast Range batholith. The contacts of the inclusion with the batholith lie about 4 miles to the north and 5 miles to the south of the principal ore-bodies. The contact between the greenstones and argillaceous sediments lies about 1½ miles northwest of Granby bay. The greenstones lie to the west and extend to Portland canal and beyond. The ore-bodies lie on or adjacent to the contact between the greenstone and argillites. This contact has a northeasterly trend, but is exceedingly irregular owing partly to faulting. The dip of the contact is almost vertical in the upper levels, but flattens considerably in the lowest workings. Owing to its irregularity, also to the highly folded and mashed condition of the argillites in its vicinity, and to the intense hydrothermal alteration, the true nature of this contact is difficult to determine...

The Coast Range batholith, which surrounds the inclusion and which occupies most of the territory in the vicinity of Portland canal and Observatory inlet, is composed of granodiorite in which quartz forms about 40 per cent, biotite and hornblende about 10 per cent, and feldspar 50 per cent of the rock. The feldspar consists of one-third orthoclase and microcline and two-thirds oligoclase and oligloclase-andesine.

At 3,200 feet northwest of the mine there is a band of coarse diorite about 250 feet wide, striking north 20 degrees to 50 degrees east, and lying nearly parallel to the greenstone-argillite contact.

The only other rocks in the vicinity are numerous dykes. As these were virtually all injected after the deposition of the ore they have no significance as to its origin; but their abundant presence in the ore-bodies has a distinct tendency to lower the grade of the ore, since most of them have to be mined.

The Ore-Bodies

There are seven ore-bodies. Numbers 1 to 5 are clustered close together about the apex of a spur of greenstone about 2,500 feet square which juts out into the argillites in a northeast direction. The sixth ore-body lies 1,300 feet to the southwest on the southeast side of the above-mentioned spur of greenstone. Another ore-body, which is really a separate deposit, but is owned by the same company and known as the Bonanza, is situated 3½ miles to the south on Bonanza creek and 3,200 feet from the shore of Granby bay. This deposit is also on a contact between the argillites and a small mass of greenstone less than a mile in diameter.

Ore-bodies 1, 4, 5, and 6 lie on the contact of the argillites and greenstones, where the argillites are much crumpled and the greenstones are especially schistose. Numbers 1 and 5 have developed where the turn in the strike of the greenstone-argillite contact is most abrupt. These ore-bodies are richer where the slate contact overhangs the ore. Ore-bodies 2 and 3 and Bonanza lie in the greenstone, where it is especially schistose, and 2 and 3 are so situated that at the time of their deposition they were probably roofed by slate.

Ore Reserves

The following dimensions will give some idea of the sizes of the ore-bodies. Ore-bodies 1 and 5 have a combined length on the 530-foot level of about 1,240 feet, with an average width of 150 feet. Number 3 is a faulted block of Number 2 and they have a combined length of 750 feet with a width of 240 feet. Number 4 ore-body lies chiefly above the 530-foot level. It is triangular in plan with a length on the 760-foot level of 560 feet. The present workings extend over a vertical range of 800 feet and diamond drilling has proved the ore-bodies to extend still deeper. They have a maximum size in cross-section on the 530-foot level, below which there is a gradual decrease in size which becomes more marked below the 150-foot level and is coincident with a sudden flattening of the greenstone-argillite contact.

There has been developed up to date on ore-bodies 1, 2, 3, 4, 5, 6, and 7, 13,215,000 tons of high-grade ore, averaging 2.14 per cent copper, and 1,534,000 tons of

low-grade ore, carrying 0.94 per cent copper. The Bonanza deposit contains 488,800 tons of 2.49 per cent ore and 577,300 tons of 0.64 per cent ore.

Composition of the Ore

The chemical composition of the ore is very well shown in the following tables which are averages of a great many determinations.

High grade Ore

Ore-body	Gold in oz. per ton	Copper %	Insoluble %	Silica %	Iron %	Sulphur %	Alumina %	Magnesia %	Lime %	Silver in oz. per ton
No. 1	0.013	2.08	26.1	22.7	29.8	30.1	4.6	1.2	5.0	0.40
No. 2	0.006	2.11	37.6	31.4	26.0	18.2	10.3	3.8	3.2	0.25
No. 3	0.002	1.83	48.4	39.4	21.7	8.1	11.5	6.6	1.8	0.11
No. 4	0.008	1.71	8.9	7.0	41.5	31.6	1.9	0.5	9.0	0.79
No. 5	0.012	2.81	17.9	16.5	34.1	33.3	1.6	n.d.	5.2	1.00
No. 6	0.010	2.44	42.3	31.1	27.1	22.0	9.1	n.d.	4.8	0.63
Bonanza. . .	0.006	2.49	35.2	27.6	26.0	17.8	10.1	6.3	2.0	0.28

Low-grade Ore

No. 1	0.004	0.71	40.6	35.9	23.6	21.1	5.9	2.0	5.4	0.14
No. 2	0.002	0.69	42.8	34.2	24.2	16.2	10.8	4.7	3.4	0.08
No. 3	0.002	0.69	50.0	42.2	22.0	7.8	11.5	6.4	1.4	0.11
No. 4	0.002	0.54	9.0	6.8	40.7	36.1	2.2	1.5	7.6	0.25
No. 5	0.003	0.66	45.8	41.5	24.8	19.0	5.1	n.d.	3.3	0.25
No. 6	0.003	0.74	62.3	55.8	14.6	9.6	10.1	n.d.	3.6	0.19

The total ore shipped from 1918 to 1921 inclusive from ore-bodies 1, 2, 3, 5 yielded 0.008 oz. of gold and 0.49 oz. of silver to the ton.

The mineralogical composition of the gangue and ore is comparatively simple and very constant. The gangue consists of silicified argillite and greenstone averaging 50 per cent silica. Scattered among the sulphides as loose individual grains are found biotite, hornblende, actinolite, epidote, quartz, and calcite; being by far the most abundant. The hornblende of this ore is of a much darker colour than that of the greenstone. The calcite is present in small disseminated grains, and seldom occurs as late veinlets cutting the ore, in the manner so common to most of the copper deposits of the Pacific region.

Minerals of the Ore

The common metallic minerals are pyrite, pyrrhotite, chalcopyrite, zinc blende, magnetite, and arsenopyrite. These constitute nearly 100 per cent of the ore, but Bancroft found also small amounts of galena, and the writer found in some high-grade ore from the Number 1 ore-body, on the 530-foot level, a small amount of native silver, associated with some arsenopyrite, and a very small amount of a soft grey mineral which is almost certainly argentite. Number 4 ore-body is different from the others. It is composed almost entirely of pyrite, in the form of small crystals less than one-sixteenth of an inch in size, cemented with calcite. Surrounding this central mass is a shell of nearly pure pyrrhotite. The copper content is so low that this ore is sold as pyrite ore.

In general the pyrite, arsenopyrite, and magnetite were deposited earlier than the pyrrohotite, zinc blende, and chalcopyrite, but in two specimens veinlets of pyrite were found cutting the pyrrhotite and chalcopyrite. The three sulphides — chalcopyrite, zinc blende, and pyrrhotite — were deposited simultaneously. The small amount of argentite occurs as rounded blebs of microscopic size in the chalcopyrite. Its age was not indicated, but it was probably precipitated at the same time as the chalcopyrite. The native silver occurs in a similar manner and is probably of the same age.

Origin of the Ore-Bodies

Regarding the origin of these ores it is Bancroft's opinion that they were formed by the replacement of greenstones and argillites by solutions that began to circulate towards the close of the intrusion of greenstones, and continued during the advance and cooling down of the Coast Range batholith. He considers the possibility of there being two periods of silicification, one related to the greenstone intrusion, and a later and more extensive one related to the invasion of the batholith; but says that the field evidence is in favour of one prolonged period of silicification and mineralization. This would involve a tremendously long period of time for the formation of these deposits. There is no doubt, however, that the great bulk of the metal of these deposits, as of all the deposits of the coast region, originated in the Coast Range batholith.

The immediate future for the Hidden Creek mine looks very bright. The costs are fairly low and the price of copper is much improved. The cost in May, 1922, of one ton of ore delivered at the smelter was $0.949.

The ore reserves on July 1, 1922, were:

Ore-body	High-grade		Low grade	
	Tons	Copper per cent	Tons	Copper per cent
1	3,866,000	1.94	672,000	0.87
2	2,305,000	1.87	269,000	0.96
3	1,188,000	1.82	427,000	1.00
4	139,000	1.90	55,000	1.20
5	1,047,000	2.90	111,000	0.90
6	255,000	2.44	. . . .	. . . .
Total	8,800,000	1.97	1,534,000	0.94
Bonanza . . .	488,800	2.49	. . . .	. . . .

This reserve will last at the present rate of production for about thirteen years.

The city of Boston has bought 15,000 tons of Welsh coal at a price less than the $15.50 charged for Pennsylvania there.

DESULPHURISING POWER OF BLAST-FURNACE SLAGS *

By RICHARD S. McCAFFERY and JOSEPH F. OESTERLE (Madison, Wis.)

This investigation was undertaken to determine the quality of different blast-furnace slags as desulphurising agents, and the possibility of using in the blast furnace, materials of higher sulphur content than is now usual. The solution of this problem would render possible the use of higher-sulphur iron ores for pig-iron, the use of cokes containing more sulphur than now employed, and the economic manufacture of iron and steels of lower sulphur content.

It is generally assumed that the sulphur that reaches the lower part of the blast furnace is removed from the iron by combining with lime to form calcium sulphide. Most of the sulphur introduced with the charge is in combination with iron or manganese, or perhaps in the coke, as a carbon compound. Iron and manganese sulphides are more soluble in iron than is calcium sulphide, but as the latter is more soluble in the slag, this fact tends to free the metal from sulphur. The reaction $FeS+CaO+CO=Fe+CaS+CO_2$ requires a high temperature and strongly reducing conditions in the presence of lime.

The investigation of sulphur solubility was begun by determining the solubility of calcium sulphide in each of the three minerals, anorthite, calcium bisilicate, and gehlenite, which constitute the largest part of the ordinary blast-furnace slags. Mixtures of chemically pure lime, alumina, and silica were made in the proportions present in anorthite, and calcium sulphide was added to these in definitely varying amounts. The slags resulting from these melts were carefully analysed, and the results reported are on the basis of these analyses. A series of cooling curves was determined for anorthite with these different percentages of calcium sulphide. This work amounts to the determination of the equilibrium of the binary systems: $CaS—CaO.Al_2O_3.2SiO_2$, $CaS—2CaO.Al_2O_3.SiO_2$, and $CaS—CaO.SiO_2$.

The system calcium sulphide-anorthite forms a eutectic with 6 per cent. calcium sulphide, melting at 1,440 deg. C., with a probable compound containing 11 per cent. calcium sulphide melting at 1,500 deg. C. In a similar way, the equilibrium of the system $CaS—CaO.SiO_2$ (calcium bisilicate) showed a eutectic of 2 per cent. calcium sulphide melting at 1,200 deg. C. For the system $CaS—2CaO.Al_2O_3SiO_2$ (gehlenite) the eutectic contains 4.5 per cent. calcium sulphide, and melts at 1,390 deg. C., and a probable compound containing 6 per cent. calcium sulphide, melts at 1,460 deg. C.

With the equilibrium of the systems being known and plotted, the solubilities of calcium sulphide are then indicated by the intersection of the horizontal temperature lines with the liquidus curve.

From these calcium sulphide solubilities, and the mineralogical composition of slag of any analysis having been determined, the solubility of calcium sulphide in slags within the range of composition generally employed for iron-furnace slags, and extending well beyond this, were calculated at temperatures of 1,350 deg., 1,400 deg., 1,450 deg., 1,500 deg., 1,550 deg., and 1,600 deg. C. In the same way, the solubility of manganese sulphide was ascertained, first in the individual slag components and then in slags of stated composition and at these temperatures.

Solubility of Calcium Sulphide at Various Temperatures, in Percentage of Total Melt

Degrees C.	Bisilicate	Anorthite	Gehlenite
1600	40	42	44
1550	31	33	35
1500	22	24	27
1450	13	16	18
1400	4	17	10
1350	4	17	10

Summary of Results

(1) The effect of alumina in blast-furnace slags is to increase the solubilities of the slags for calcium sulphide and to diminish their solubilities for manganese sulphide.

(2) The effect of high temperatures in increasing the solubilities of the slags for both calcium and manganese sulphides is very marked.

(3) The actual chemical composition of the slag, as affecting the solubilities of calcium and manganese sulphides, is of less importance than the temperature of the slag.

(4) The change in calcium and manganese-sulphide solubilities is probably less influenced by the basicity of the slag chemically than it is by the indirect action of the more basic slag in increasing the hearth temperature.

(5) The region in which solution of calcium and manganese sulphides in the slag is most rapid is the hearth of the blast furnace.

* From a Paper read before the Montreal meeting of the American Institute of Mining and Metallurgical Engineers.

WASTE OF MANGANESE ORE

Wasteful methods in the washing of manganese ores, produced in the Kutais district in the Caucasus, are depriving the world of enormous supplies of this material, according to a statement made by C. E. Julihn, representing the United States Department of the Interior. Such waste is of international interest, Mr. Julihn emphasizes, because of the relatively small reserves of high-grade manganese known to exist and the importance of such ores in the manufacture of steel.

A study of the preparation of the Kutais ores, made by J. W. Furness, associate mining engineer of the Bureau of Mines, develops the fact that the tremendous wastes now occurring are due to the desire to meet an unreasonable and unnecessary trade requirement calling for manganese of 52 per cent grade. An annual production of approximately a million tons of ore containing 52 per cent manganese is made from the Kutais deposits by washing ore which averages 47 per cent of the original manganese. This means in effect that, in order to make an improvement of 5 per cent in grade, about one-half the manganese mined is lost in washing.

The Bureau of Mines investigation developed that about 20 per cent of the production from these deposits is marketed in the United States, 40 per cent in Great Britain, and the remainder in France, Germany, and Italy. To these countries, which are the great steel producers, the conservation of high-grade manganese is especially important.

It was pointed out by Mr. Julihn that there are no established international agencies authorized to consider

such unwarranted wastes of the world's precious natural resources. The consumers, he declared, are most concerned with obtaining the highest possible grade of material without thought or responsibility as to the future of world industry. It is hoped that the calling of attention to these serious manganese losses may lead to some means of remedying the situation and thereby establish a precedent for the correction of other unsound international trade practices.

ANOTHER SECTION OF THE YUKON MAPPED

"In reviewing the published descriptions of the mineral deposits of Whitehorse, Wheaton, and Conrad districts, it was found that whatever the genesis of those deposits has been established it is attributed to the intrusion of the Coast Range batholith. It was, consequently, considered advisable to map the eastern edge of these granitic rocks in order that prospectors might know more precisely the location of the zone, adjacent to these rocks, in which ore-bodies are likely to occur. With this in view, the writer commenced mapping such parts of the area lying between longitudes 134 and 136 degrees and latitudes 60 and 61 degrees as had not already been mapped."

These were the marching orders of W. E. Cockfield in the spring of 1922, and his interim report was published in *Summary Report,* 1922, *Part A.* The area lies to the west of the railway between Skagway and Whitehorse and is underlain by rocks ranging in age from pre-Cambrian schists to lava flows of Pleistocene or Recent times.

The principal geological feature is the Coast Range batholith, which is almost exclusively the rock of the western part of the area. In the central part the present land surface corresponds closely with the original roof of the batholith, so that many inclusions or "islands" of the intruded rocks remain. The eastern portion of the area is believed to be underlain also by the batholith. Obviously it is good prospecting ground.

The prospecting already done, most of it carried on ten to twenty years ago, has disclosed deposits of copper, gold-silver, silver-lead and antimony-silver ores, as well as coal. None of the deposits are being worked at present. Dr. Dolmage examined a few of these deposits, and suggests that, in view of the small amount of development done, further work might disclose ore-shoots that would pay in spite of the distances from the railway. In every case the origin of the ore-deposits can be attributed directly to the intrusion of rocks connected with the Coast Range batholith. As there is no demand for coal in southern Yukon, no prospecting for it is being carried on at present.

REVISED SILVER STATISTICS FOR 1922

The Dominion Bureau of Statistics has issued the following finally revised statistics on the production of Silver in Canada during 1922, under date of August 17th.

Special Note.— Prior to 1922, the method used in compiling the statistics on the silver production of Canada was to include, except for Ontario, the quantities of silver produced from Canadian ores either in Canadian or foreign smelters. For Ontario, the sales of silver bullion from the mines and smelters were considered as the year's production. In order to bring the practice for Ontario into harmony with that used in computing the silver output for the other provinces, adjustments amounting to 1,222,450 ounces have been made for 1922 to take account of the stocks of silver bullion on hand at the end of 1921 which had not been previously included in the reports of the mineral production of Canada.

As above defined, the production of silver in Canada during 1922 amounted to 18,581,439 fine ounces which at the average price for the year of 67.251 cents an ounce was valued at $12,576,758 as against 13,543,198 fine ounces valued at $8,485,355 for 1921, an increase of 37 per cent in quantity and 48 per cent in value.

The production in 1922 included (a) silver contained in silver and gold bullion (including the adjustments noted above) 10,032,909 fine ounces or 54.0 per cent, (b) silver contained in blister copper and lead bullion, 3,502,367 fine ounces or 18.8 per cent, (c) silver estimated to have been recovered from ores, etc. exported, 5,046,163 fine ounces or 27.2 per cent. The corresponding figures for 1921 were (a) 9,080,718 ounces 67.0 per cent, (b) 1,649,057 ounces or 12.0 per cent, (c) 2,813,423 ounces or 21.0 per cent.

The monthly average of the New York quotation for silver which was 65.540 cents per ounce in January rose to 71.154 cents in May and than gradually declined until in December the average quotation was 63.805 cents.

PRODUCTION OF SILVER IN CANADA BY PROVINCES

Nova Scotia	86	58
Ontario: Production	9,589,453	6,474,895
Adjustments	1,222,450	825,410
Manitoba	20	14
British Columbia	7,105,937	4,828,384
Yukon Territory	663,493	447,997
Total for CANADA	18,581,439	12,576,758

INFUSORIAL EARTH

Infusorial and diatomaceous earths—sometimes called tripolite—are very light and extremely porous materials composed of pure silica which have been laid down under water and consist of the remains of microscopical infusoria and diatoms.

The former are animal remains, and the latter are from plants. The principal commercial use of this material is as an absorbent. It is also employed in the manufacture of scouring soap and polishing powders; for filtration purposes; in making some classes of refractory brick; and as an insulating medium both in heating and refrigeration. It is a first class non-conductor of heat, where high temperatures are employed, such as around steel and gas plants and power houses. In such cases, it is built in as an insulating layer in furnace walls. In Germany, under the name 'kiesel guhr,' it was used as an absorbent for nitro-glycerine in the early manufacture of dynamite.

As a non-conductor of heat it has been used alone or with other materials as a covering for boilers, steam pipes, and safes and in fireproof cements. It is used largely by paint manufacturers as a wood filler. Boiled with shellac it is made into records for talking machines. It has been used for absorbing liquid manures so that they could be utilized as fertilizers, and as a source of silica in making water-glass as well as in the manufacture of cement, tile glazing, artificial stone, ultra-marine and other pigments of aniline and alizarine colors, paper filling , sealing wax, fireworks, hard-rubber objects, matches, and papier-maché, and for solidifying bromine. For making insulating brick the material is sawed into blocks, and for all other purposes it is ground and screened.

THE MINING DISTRICTS

By THE JOURNAL'S CORRESPONDENTS

NOVA SCOTIA

Canon Scott's Blue Glasses. — The saying is just as true today as when it was first uttered, "Seek and ye shall find"; men usually find what they seek. Canon Scott says he came to Cape Breton seeking certain things, — and he found them. He would have been just as successful in finding if he had sought to see the better side of conditions at the Cape Breton collieries. After dealing with the appearances and the sanitary conditions of the company houses and bath houses at the collieries, the wages paid to some few mine workers, he sums up by stating publicly that "the general atmosphere is one of gloom and a spirit of depression pervades the whole region; the men do not trust the company and the company do not trust the men."

Had the venerable Canon visited No. 4 colliery say sixty years ago, he would have found the houses all newly built in the style of the day, and looking spick and span. Change and decay attack both men and houses, and if these latter do look the worse for wear (as does the good Canon himself), it is only natural. He selected the oldest colliery in the district for his first visit, and surely he did not expect to find signs of youth and beauty. Seemingly nothing about the colliery pleased him. We would not like to say that the Dominion Coal Company is altogether pleased with all the conditions at this or any other mine; but they cannot change all the old things and make them new to please Canon Scott or anyone else. The best that can be done is to keep the houses in good repair and comfortable, and the miners themselves see to it that this is done. They need no one to speak for them in this matter, for they do get close enough to the company to co-operate, and there is a thorough understanding that company houses are to be kept in repair. The rent paid is not high, ranging from two to eight dollars per month according to the size. For a four to eight-room house, no one will say that this rent is excessive. In addition to the house there are fairly large plots of ground that can be used for gardening or for playgrounds as the miner and his family see fit.

The Bath House Problem. — The bath house at Caledonia is an old one, but although the Canon has not said so, no doubt he was told that a new one had been designed and will be erected just as soon as the Company can get round it. He was shown a model bath house at No. 2 colliery, and could have had the pleasure of seeing others if he had cared to visit them. These bath houses are not surpassed on the continent for convenience and comfort, and it is the intention of the Coal Company to have every bath house remodelled where the prospective life of the colliery warrants it. Rome was not built in a day; and the British Empire Steel Corporation since it took hold has had many things of this nature to do. They have spent enormous sums om money in making these changes and are not by any means through with that work.

Miners Prefer Motor-cars to Good Houses. — The building of houses is one of the most serious questions facing the coal companies today. It seems probable that this will be one question that in the future will curtail very largely the output of this and other coal companies of the Province. To build a house and equip it with all modern conveniences would raise the cost of coal to an exorbitant price. Miners would not pay the rents asked, neither would buyers of coal willingly pay the price. Indeed, as the market is today, Nova Scotia could not compete and conditions at the collieries would be worse instead of better. The average miner of Cape Breton has caught the spirit of the age, and for a change of scenery he will go out into the country, as do many others. Many of them who live in company houses rented at a low rate possess very fine automobiles, and prefer these to paying high rents or even to becoming owners of their own houses.

Too Much Meddling by Outsiders. — But why should miners be singled out as a class apart from all others, for public sympathy and public pity? The majority of miners do not thank these self-appointed benefactors; they resent all this humbug about the low conditions and low standard of living at the collieries and are tired of the whole business. In "military" language, they are "fed up" and want no more of it.

The time has come when the industries of Nova Scotia should cry "hands off." The Province has all too few industries, and these few are being ridden to death by men who add nothing in the way of information or inspiration. There is nothing to hide at the collieries, but there is much more to learn than can be accomplished by a Canon on a flying visit. Providence has supplied an abundance of coal; but in many respects the coal fields are at a disadvantage compared with those of the United States. The natural conditions are hard to overcome, which increases the cost. The climate is severe, and except in summer, transportation at a profit is impossible. Yet we have wiseacres with vision of a new heaven and a new earth, who believe all can be changed tnd Utopia ushered in with a wave of the magician's wand. It cannot be done, and we must take things as we find them and make the most of them.

Miners Get High Wages. — With regard to wages, the Dominion Coal Company would profit by making a public statement of wages earned at their collieries. They are in a position to show to the public that, except for a few men who are getting the minimum wage, the miners do earn unusually large wages. Indeed, many miners earn twice as much as the salaries paid to some of the professional men in the colliery districts.

Nova Scotia has within the last two years been cursed by commissions and agitators. The minds of the workers have been for a time buoyed up by false hopes, only to be cast down after fruitless investigation has revealed nothing new and has made no changes. "Laissez faire" should be the slogan for Nova Scotia industries just now.

The Ford Motor Company has under construction an electric furnace of 60 to 80 tons capacity, built on the lines of an open-hearth.

ROYAL CANADIAN AIR FORCE

The Department of National Defence, Ottawa, has made an announcement through the columns of *Natural Resources* of the provisions for the co-operation of the Royal Canadian Air Force with various other government departments.

The increasing demand on the Royal Canadian Air Force for aerial transportation in connection with forestry, survey, inspection, and related work and for transportation for those services working in the remoter parts of the country, made it desirable to form some organization where the problems incidental to this work could be considered, and as a result an inter-departmental committee on flying operations for the civil services of the Government of Canada has been constituted. The committee will provide for the interchange of information between the various services interested, for the consideration of the results obtained, the co-ordination of flying programmes throughout the country and discussion of all matters arising.

The first meeting of the committee was attended by representatives of the following services:—

Department of the Interior: Surveys Bureau, Topographical Survey, Forestry Branch, National Parks Branch, International Boundary Commission, North West Territories Branch, Geodetic Survey, Dominion Water Power Branch, Dominion Observatory.

Department of Mines: Geological Survey.

Department of Agriculture: Entomological Branch, Experimental Farms Branch.

Department of Public Works: Chief Engineer's Branch.

Department of Indian Affairs.

The programme of flying operations for 1923 was discussed and information was given to the meeting as to the nature and extent of the operations contemplated. By giving all services full information as to the whole programme it has been possible to consolidate the work and arrange for co-operation between the various departments served so that operations undertaken in any district may serve as many departments as possible.

IRON FORMATION

"Iron formation," an expression used a good deal in pre-Cambrian geology, consists of iron ore such as siderite, magnetite, or hematite, with more or less silica in the form of chert, jasper, etc., generally in bands, but sometimes not distinctly so. The bands of iron ore are at times high-grade, but are often mixed with a good deal of silica, the whole making an ore too lean for use without concentration. Iron formation is believed to be of sedimentary origin.

Limonite is sometimes formed in large quantities by the weathering of the sulphides of iron; such gossan has occasionally been used as a iron ore. At Bannockburn, Ontario, a pyrite deposit was discovered below limonite which was being mined as an iron ore; this gossan capping of the pyrite was from eight to fifteen feet deep.

Manganese, like iron, is present in all rocks, but not so plentifully as iron. In the weathering of rocks, manganese is more easily dissolved than iron; but, on the other hand, iron is more easily precipitated from the solution. These differences account for the separation of iron ores from manganese ores in sedimentary deposits.

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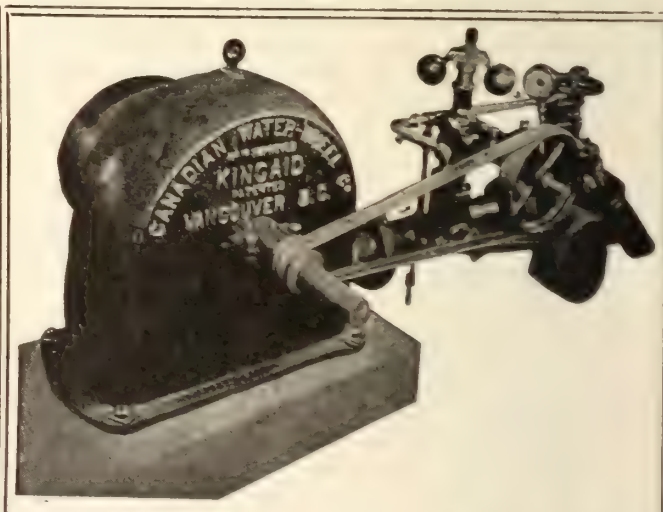

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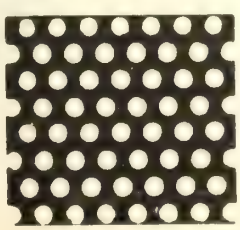

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Peacock Brothers, Limited.
The William Kennedy & Sons, Ltd.

Ball Mills:
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
Mine & Smelter Supply.

Ball Mill Feeders:
Herbert, Alfred, Limited.
Holman Bros. Ltd.
Hull Iron & Smelter Supply.
Mine & Smelter Supply.

Ball Mill Linings:
Canadian Steel Foundries, Ltd.
The William Kennedy & Sons, Ltd
Peacock Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
Mine & Smelter Supply.

Belting — Leather, Rubber & Cotton:
Link-Belt Limited.
Jones & Glassco (Regd.).

Belting:
Gutta Percha & Rubber, Ltd.

Belting (Conveyor):
Canadian Fairbanks-Morse Co., Ltd.
Gutta Percha & Rubber Ltd.
Dunlop Tire & Rubber Co., Ltd.

Belting — Silent Chain:
Link-Belt Limited
Hans Renold of Canada, Ltd.
Jones & Glassco (Regd.).

Bins & Hoppers:
Hendrick Manufacturing Co.
The William Kennedy & Sons, Ltd

Bluestone:
The Consol'd Mining & Smelting Co.

Boilers:
The William Kennedy & Sons, Ltd

Boxes, Cable Junction:
Standard Underground Cable Co. of Canada, Ltd
Northern Electric Co., Ltd.

Brazilian Ballas:
Diamond Drill Carbon Co.

Bronze, Manganese, Perforated & Plain:
Hendrick Manufacturing Co.

Buckets:
Canadian Ingersoll-Rand Co. Ltd.
Canadian Fairbanks-Morse Co., Ltd.
Hadfields, Limited
Hendrick Manufacturing Co.
Herbert, Alfred, Limited
Holman Bros., Ltd.
Link-Belt Limited
The William Kennedy & Sons Ltd
Peacock Bros., Ltd.

Bucket Lips:
Canadian Steel Foundries, Ltd.
The William Kennedy & Sons Ltd

Buggies, Mine Car (Steel):
Hendrick Manufacturing Co.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Powley & Moody Limited.

Cable — Aerial and Underground:
Canada Wire & Cable Co.
Standard Underground Cable Co. of Canada, Ltd.
Peacock Brothers Limited

Cables — Wire:
Standard Underground Cable Co. Ltd.
Canada Wire & Cable Co.
Peacock Bros. Ltd.

Cable Railway Systems:
Canada Wire & Cable Co.

Cages:
Canadian Ingersoll-Rand Co. Ltd.
The Mine & Smelter Supply Co.
Herbert, Alfred, Limited.
Holman, Ltd.
The William Kennedy & Sons, Ltd.

Cam Shafts:
Canada Foundries & Forgings, Ltd.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
Powley & Moody, Limited.
Peacock Brothers, Ltd.

Cars:
Canadian Mead-Morrison Co.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
John J. Gartshore.
Peacock Brothers, Limited.
Powley & Moody, Limited.
The William Kennedy & Sons, Ltd.

Car Dump:
Canadian Mead-Morrison Co.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Powley & Moody, Limited.
Sullivan Machinery Co.

Cars—Hand:
Sylvester Mfg. Co., Ltd.

Cars—Mine:
William Kennedy & Sons Ltd.

Car Pullers:
Canadian Mead-Morrison Co.

Carries (Gravity):
Jones & Glassco, Reg.

Car Wheels and Axles:
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
John J. Garthshore.
Peacock Brothers, Limited.
Powley & Moody, Limited.
The William Kennedy & Sons, Ltd.

Cast Steel Gears:
Canada Foundries, Ltd.
The William Kennedy & Sons, Ltd

Castings (Iron and Steel):
Herbert, Alfred, Limited.
Holman, Bros., Ltd.
Peacock Brothers, Limited.
The William Kennedy & Sons, Ltd.

Cement Machinery:
Hadfields, Limited.
Hull Iron & Steel Foundries, Ltd.
The William Kennedy & Sons, Ltd.

Chains:
Jones & Glassco, Reg.
Canadian Link-Belt Co., Ltd.
Greening, B. Wire Co., Ltd.
Powley & Moody, Limited.

Chain Drives:
Jones & Glassco (Regd).
Powley & Moody, Limited.

Chain Drives — Silent & Steel Roller:
Link-Belt Limited.
Hans Renold of Can., Ltd.
Jones & Glassco (Regd.).

Chemist:
Thos. Heyes & Sons.
Milton Hersey Co.
Ledoux & Co

Classifiers:
The Dorr Company.

Clutches:
Link-Belt Limited.
Hans Renold of Can., Ltd.

Coal:
Dominion Coal Co.
Nova Scotia Steel & Coal Co.

Coal Cutters — Coal Pick Machines:
Sullivan Machinery Co.
Canadian Ingersoll-Rand Co., Ltd.
Hebert, Alfred, Limited.
Holman Bros., Ltd.
Peacock Brothers, Limited.

Coal Crushers & Conveyors:
Link-Belt Limited.
Peacock Brothers, Limited.

Coal Mining Machinery:
Canadian Ingersoll-Rand Co., Ltd
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co. Ltd
Hadfields, Limited.
Hendrick Mfg. Co.
Hebert, Alfred, Limited.
Holman Bros. Ltd.
Powley & Moody, Limited.
Sullivan Machinery Co.

Coal Screening Plants:
Link-Belt Limited.
Canadian Mead-Morrison Co.

Cobalt Oxide:
Deloro Smelting & Refining Co., Ltd.

Compressors — Air:
Belliss & Morcom, Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Denver Rock Drill Mfg. Co.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Laurie & Lamb.
Smart-Turner Machine Co.
Peacock Brothers, Limited.

Concentrating Tables:
Herbert, Alfred, Limited.
Holman Bros., Ltd.
The Mine & Smelter Supply Co.

Concrete Mixers:
Gould, Shapely & Muir Co., Ltd.

Condensers:
Canadian Ingersoll-Rand Co. Ltd.
Belliss & Morcom, Ltd.
Laurie & Lamb.
Peacock Brothers, Ltd.

Condensers — Electrical Static & Power:
Griswold & Co.

Consulters and Engineers:
Milton Hersey Co., Ltd.

Conveyors:
Link-Belt Limited.
Canadian Mead-Morrison Co.
Jones & Glassco (Regd.).

Conveyor Belts:
Gutta Percha and Rubber, Ltd

Conveyor Flights:
Hendrick Manufacturing Co.

Conveyor — Trough — Belt:
Link-Belt Limited.
Hendrick Mfg. Co.
Jones & Glassco, Regd.

Copper:—
Consolidated Mining & Smelting Co.

Couplings:
Hans Renold of Can., Ltd.

Cranes:
Link-Belt Limited.
Canadian Mead-Morrison Co.
Peacock Brothers, Limited.

Crane Ropes:
Allan Whyte & Co.
Canada Wire & Cable Co.
Greening B., Wire Co., Ltd.

Crucibles:
The Mine & Smelter Supply Co.

Crusher Balls:
Canada Foundries & Forgings, Ltd.
Herbert, Alfred, Limited.
Holman, Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
Peacock Brothers, Limited.
The William Kennedy & Sons, Ltd.

Crusher Jaws:
Canadian Steel Foundries, Ltd.
The William Kennedy & Sons, Ltd.

Crushing Rolls:
Canadian Steel Foundries, Ltd.
The William Kennedy & Sons, Ltd.

Crushers — Jaw & Gyratory:
Canadian Ingersoll-Rand Co., Ltd.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
Lymans, Limited.
The Mine & Smelter Supply Co.
Hadfields, Limited.

Cut Gears:
Hans Renold of Can., Ltd.
Jones & Glassco, Regd.
The William Kennedy & Sons, Ltd.

Cyanide:

Cyanide Plant Equipment:
The Dorr Co.
The Mine & Smelter Supply Co.

Diamond Drill Contractors:
Smith & Travers
Sullivan Machinery Co.

Diesel Engines:
Belliss & Morcom, Ltd.
Laurie & Lamb.
Lammers & Maase, Ltd.

Dies:
Canada Foundries & Forgings, Ltd.
Herbert, Alfred, Limited.
Hull Iron & Steel Foundries, Ltd.
Holman Bros., Ltd.

Dredging Ropes:
Allan Whyte & Co.
Greening, B. Wire Co., Ltd.

Dredges:
Canadian Mead-Morrison Co.

Dredger Pins:
Hull Iron & Steel Foundries, Ltd.

Dredging Machinery:
Hadfields, Limited.
Hull Iron & Steel Foundries, Ltd.

Drills — Air and Hammer:
Canadian Ingersoll-Rand Co., Ltd
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Herbert, Alfred, Ltd.
Holman Bros., Ltd.
Sullivan Machinery Co.
The Mine & Smelter Supply Co.

Drills — Core:
Canadian Ingersoll-Rand Co., Ltd.
Herbert, Alfred, Limited
Holman Bros., Ltd.
Sullivan Machineery Co.

Drill Steel Furnaces:
Canadian Ingersoll-Rand Co., Ltd.
Denver Rock Drill Mfg. Co
Herbert, Alfred, Limited
Holman Bros., Ltd.
Sullivan Machinery Co.

Drills — Diamond:
Sullivan Machinery Co.

Drill Steel — Mining:
Canadian Ingersoll-Rand Co., Ltd.
Hadfields, Limited
Mussens, Limited

Drill Steel Sharpeners:
Canadian Ingersoll-Rand Co., Ltd.

Drills — Electric:
Herbert, Alfred, Limited
Holman Bros. Ltd.
Sullivan Machinery Co.
Northern Electric Co., Ltd.

Drills — High Speed and Carbon:
Hadfields, Limited
Herbert, Alfred, Limited
Holman Bros, Ltd.

Ejectors:
Canadian Ingersoll-Rand Co., Ltd.

Electric Condensers:
Griswold & Co.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Herbert, Alfred, Limited
Holman Bros., Limited
Northern Canada Supply Co.

Electric Hoists:
Canadian Mead-Morrison Co.

Elevators:
Canadian Machinery Co.
Sullivan Machinery Co.
Link-Belt Limited.
Northern Canada Supply Co.
Hadfields, Limited.
Jones & Glassco (Regd.).

Engineering & Surveying Instruments:
Laurie & Lamb.

Engines — Ventilating:
Canadian Sirocco Co., Ltd.

Engines, Diesel:
Bellis & Morcom Ltd.
Laurie & Lamb
Lammers & Maase, Ltd.

Engines — Gas and Gasoline:
Belliss & Morcom, Ltd.
Sullivan Machinery Co.
Gould, Shapely & Muir Co., Ltd.
Laurie & Lamb.
The Mine & Smelter Supply Co.
Powley & Moody, Limited.

Engines — Haulage:
Canadian Ingersoll-Rand Co., Ltd.
Powley & Moody, Limited

Engines — Steam:
Canadian Ingersoll-Rand Co., Ltd.
Laurie & Lamb.

Engineers:
Dresser, John A.
Dorr Co.
Ferrier, W. F.
Hore, R. E.
Heves & Sons, Thos.
Hersey Co. Ltd., Milton
McEvoy, James C.
Rogers, George R.
Ross, Jas. G.
Stewart, Robert H.
Tyrell, J. B.
Whitman, Alfred B.
Wilson, Ridgeway R.

Exhauster:
Canadian Sirocco, Ltd.

Ferro-Alloys (all Classes):
Canadian Steel Foundries, Ltd.

Fire Fighting Supplies:
Gutta Percha & Rubber, Ltd.

Flood Lamps:
Northern Electric Co., Ltd.

Flotation Oil:
Hercules Powder Co.

Fluorspar:
Consolidated Mining & Smelting Co.
Everitt & Co.

Forging:
Canada Foundry & Forging, Ltd.
Herbert, Alfred, Limited
Holman Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
Smart-Turner Machine Co.

Frogs: — See Switches & Turntables
Canadian Steel Foundries, Ltd.
Hull Iron & Steel Foundries.
John J. Gartshore.

Furnaces — Assay:
Lymans, Limited.
Mine & Smelter Supply Co.

Gasoline Extraction Compressors:
Canadian Ingersoll-Rand Co., Ltd.
Sullivan Machinery Co.

Gasoline Tanks — See Tanks:
Can. Chicago Bridge & Iron Co., Ltd.
Horton Steel Works, Ltd.
Hendrick Manufacturing Co.

Gaskets:
Gutta Percha & Rubber, Ltd.

Gears:
Hans Renold of Canada, Ltd.
Jones & Glassco, Regd.
The William Kennedy & Sons, Ltd.

Gears (Cast):
Link-Belt Limited.
The William Kennedy & Sons, Ltd.
Hull Iron & Steel Foundries, Ltd.

Gears: Machine Cut:
The Hamilton Gear & Machine Co.
The William Kennedy & Sons, Ltd.

Gold Refiners:
Goldsmith Bros.

Gold Pans:
Can. Chi. Bridge & Iron Works, Ltd.
Horton Steel Works, Ltd.

Grab-Buckets:
Canadian Mead-Morrison Co.

Hose:
Goodyear Tire & Rubber Co.
Gutta Percha & Rubber, Ltd.
Dunlop Tire & Rubber Co.

Hangers and Cables:
Stan. Underground Cable Co., Ltd.

Heating Systems:
Canadian Sirocco Co., Ltd.

High Speed Steel:
Hadfields, Ltd.

Hoists — Air, Electric and Steam:
Canadian Ingersoll-Rand Co., Ltd.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Herbert, Alfred, Ltd.
Holman Bros., Ltd.
Jones & Glassco, Regd.
Mine & Smelter Supply Co.
Canadian Link-Belt Co., Ltd.
Peacock Bros., Ltd.
Sullivan Machinery Co.

Hoisting Towers:
Canadian Mead-Morrison Co.

Hydraulic Machinery:
Hadfields, Ltd.
Belliss & Morcom, Ltd.
Laurie & Lamb.
The William Kennedy & Sons, Ltd.

Industrial Chemists & Inspectors:
Hersey, M. & Co., Ltd.

Insulating Compounds:
Standard Underground Cable Co.

Jacks:
Northern Canada Supply Co.
Jaw & Gyratory Crushers, See Crushers:

Lamp-Miners:
Northern Electric Co.
Peacock Bros., Ltd.
Powley & Moody, Limited.

Lead (Pig):
Consolidated Mining & Smelting Co.

Link Belt — See Chain Drives:
Locomotives (Steam Compressed Air and Storage):
Canadian Ingersoll-Rand Co., Ltd.
Laurie & Lamb.
Powley & Moody, Limited.

Machine Guards:
Greening, B. Wire Co., Ltd.

Magnesium Metal:
Hull Iron & Steel Foundries, Ltd.

Manganese Steel, See Steel, Manganese:
Canadian Steel Foundries, Ltd.
Hadfields, Ltd.

Metal Merchants:
Consolidated Mining & Smelting Co.
C. L. Constant Co.

Metallurgical Engineers:
The Dorr Co.

Metallurgical Machinery:
Dwight & Lloyd Sintering Co.
The Dorr Co.
The Mine & Smelter Supply Co.

Metal Work, Heavy Plates:
Can. Chicago Bridge & Iron Co., Ltd.
Horton Steel Works, Ltd.
Hendrick Manufacturing Co.
The William Kennedy & Sons, Ltd.
Powley & Moody, Limited.

Mica:
Everitt & Co.

Mine Cars — See Cars, Mine:
The William Kennedy & Sons, Ltd.
Powley & Moody, Limited.

Mining Engineers:
Hersey, M. & Co., Ltd.
Mining Requisites:
Dominion Wire Rope Co., Ltd.
Hadfields, Limited.
Hull Iron & Steel Foundries, Ltd
Powley & Moody, Limited.
Mining Ropes — See Cable:
Mine Surveying Instruments:
C. L. Berger & Sons.

Molybdenite:
Everitt & Co.

Motors:
Peacock Brothers, Ltd.
Powley & Moody, Limited.
Nickel:
The Mond Nickel Co., Ltd.
Oil Engines — Reverse:
Canadian Ingersoll-Rand Co., Ltd.

Oil Storage Tanks — See Tanks:
Can. Chicago Bridge & Iron Co., Ltd.
Horton Steel Works, Ltd.
Hendrick Manufacturing Co.
The Toronto Iron Works, Ltd.

Ore Handling Equipment:
Link-Belt Limited.
Canadian Mead-Morrison Co.
Herbert, Alfred, Limited.
Ore Sacks:
Northern Canada Supply Co.
Ore Testing Works: See Assayers & Chemists:
Ores & Metals—Buyers & Sellers of:
Geo. G. Blackwell.
Consolidated Mining & Smelting Co.
Everitt & Co.
Oils:
Hercules Powder Co.
Pavers:
Wettlaufers Brothers.
Gutta Percha & Rubber, Ltd.
Laurie & Lamb.

Perforated Metals:
Hendrick Mfg. Co.
Canada Wire & Iron Goods Co.
Greening, B. Wire Co.

Pillow Blocks:
Canadian Link-Belt Co., Ltd.

Pipes:
Consolidated Mining & Smelting Co.
The William Kennedy & Sons, Ltd.

Pipe — Wood Stave:
Pacific Coast Pipe Co.
Mine & Smelter Supply Co.
Canadian Ingersoll-Rand Co., Ltd.

Piston Rock Drill—see Drills, Air & Hammer:

Plate Works:
Can. Chi. Bridge & Iron Co., Ltd.
Hendrick Mfg. Co.
The William Kennedy & Sons, Ltd.
Horton Steel Works, Ltd.

Platinum Refiners:
Goldsmith Brothers.

Pneumatic Tools:
Canadian Ingersoll-Rand Co., Ltd
Herbert, Alfred, Limited.
Holman Bros., Ltd.

Portable Column Hoists: see
Canadian Ingersoll-Rand Co., Ltd.
Denver Rock Drill Mfg. Co
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Sullivan Machinery Co.

Poultry Netting:
Greening, B. Wire Co., Ltd.

Power Factor Correcting Devices:
Griswold & Co.

Power Condensers:
Griswold & Co.

Prospecting Mills & Machinery:
Mine & Smelter Supply Co.

Pulleys Shafting and Hangers:
The William Kennedy & Sons Ltd

Pulverizers — Laboratory:
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Mine & Smelter Supply Co.

Pumps — Pneumatic:
Canadian Ingersoll-Rand Co., Ltd.
Smart-Turner Machine Co.
Sullivan Machinery Co.

Pumps — Steam:
Canadian Ingersoll-Rand Co., Ltd
Northern Canada Supply Co.
Peacock Brothers, Ltd.
Smart-Turner Machine Co.

Pumps-Turbines:
Smart-Turner Machine Co.
Canadian Ingersoll-Rand Co., Ltd.
Laurie & Lamb.
Peacock Brothers, Ltd.

Pumps-Vacuum:
Canadian Ingersoll-Rand Co. Ltd
Smart-Turner Machine Co.
Peacock Brothers, Ltd.

Pumps — Boiler Feed:
Canadian Ingersoll-Rand Co., Ltd
Peacock Brothers, Ltd.

Pumps — Centrifugal:
Canadian Ingersoll-Rand Co., Ltd.
Laurie & Lamb.
Peacock Brothers, Limited
Smart-Turner Machine Co.

Pumps — Diaphragm:
The Dorr Company.
The William Kennedy & Sons, Ltd.

Pumps — Electric:
Canadian Ingersoll-Rand Co., Ltd
Laurie & Lamb.
Peacock Brothers, Ltd
Smart-Turner Machine Co

Pumps — Sand & Slime:
Canadian Ingersoll-Rand Co., Ltd
Laurie & Lamb.
Mine & Smelter Supply Co.
Sylvester Mfg. Co., Ltd.

Pumps — Valves:
Peacock Brothers, Ltd.

Push Cars — See Cars, Push:
Powley & Moody, Limited

Quarrying Machinery:
Canadian Ingersoll-Rand Co., Ltd.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Sullivan Machinery Co.

Rails:
Hadfields, Limited.
John J. Gartshore.
Powley & Moody, Limited.

Refiners:
Goldsmith Brothers

Riddles:
Hendrick Mfg. Co.

Rod Mills:
Mine & Smelter Supply Co.

Roll Shells:
The William Kennedy & Sons, Ltd.
Canadian Steel Foundries, Ltd.

Rolls — Crushing:
Canadian Ingersoll-Rand Co., Ltd.
Hadfields, Limited.
Hull Iron & Steel Foundries, Ltd.
Herbert, Alfred, Ltd.
Holman Bros. Ltd.
Wettlaufer Bros.

Roller Chain:
Hans Renold of Canada, Ltd.
Link-Belt Limited.
Jones & Glassco, Regd.

Rope — Manilla & Jute:
Jones & Glassco, Regd.
Allan, Whyte & Co.

Rope — Wire:
Anglo Canadian Wire Rope Co.
Allan, Whyte & Co., Ltd.
Canada Wire & Cable Co.
Canada Wire & Iron Goods Co.
Dominion Wire Rope Co., Ltd.
Greening, B. Wire Co.

Saline Refiners:
Goldsmith Brothers.

Samplers:
Canada Metal Co.
Ledoux & Co.
Milton Hersey Co.
Thos. Heyes & Son.
Mine & Smelter Supply Co.

Screens:
Canadian Ingersoll-Rand Co., Ltd.
Greening, B. Wire Co.
Hendrick Mfg. Co.
Canada Wire & Iron Goods Co.

Screens — Cross Patent Flanged Lip:
Hendrick Mfg. Co.

Screens — Perforated Metal:
Hendrick Mfg. Co.

Screens Shaking:
Link-Belt Limited.
Hendrick Mfg. Co.

Screens — Revolving:
Link-Belt Limited.
Hendrick Mfg. Co.
The William Kennedy & Sons, Ltd.

Separators:
Smart-Turner Machine Co.
Mine & Smelter Supply Co.

Sewer Pipes:
Wettlaufer Bros.

Sheet Metal Work:
Hendrick Mfg. Co.

Sheets — Genuine Manganese Bronze:
Hendrick Mfg. Co.

Sheets and Dies:
Hull Iron & Steel Foundries, Ltd.
Peacock Brothers, Ltd.
The William Kennedy & Sons, Ltd.

Ship Loaders: see Conveyors
Canadian Mead-Morrison Co.

Silent Chain: See Chain Drives
Powley & Moody, Limited.
Silent & Steel Roller—See Roller Silent Steel.

Sledges:
Canada Foundries & Forgings,

Sintering:
Dwight & Lloyd Sintering Co., Inc.

Smelters:
Goldsmith Bros.

Smoke Stacks:
Can. Chicago Bridge & Iron Co., Ltd.
Horton Steel Works, Ltd.
Hendrick Mfg. Co.
The William Kennedy & Sons, Ltd.

Special Machinery:

Spelter:
The William Kennedy & Sons, Ltd.
Consolidated Mining & Smelting Co.

Sprockets:
Hans Renold of Canada, Ltd.
Canadian Fairbanks Morse Co., Ltd.
Link-Belt Limited.
Jones & Glassco, Regd.
The William Kennedy & Sons, Ltd.

Spring Coil & Clips Electric:
Canadian Steel Foundries, Ltd.

Stamp Batteries:
Herbert, Alfred, Limited.
Holman Bros., Ltd.

Stamp Forgings:
Canada Foundries & Forgings, Ltd.
Hull Iron & Steel Foundries.

Steel Barrels:
Smart-Turner Machine Co.

Steel Castings:
Canadian Steel Foundries, Ltd.
Canadian Brakeshoe Co., Ltd.
Hull Iron & Steel Foundries, Ltd.
Hadfields, Ltd.
The William Kennedy & Sons, Ltd.
Denver Rock Drill Mfg. Co., Ltd.
Sullivan Machinery Co.
Peacock Brothers Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Canadian Mead-Morrison Co.

Steam Hoisting Engines:
Canadian Mead-Morrison Co.

Steel Drums:
Smart-Turner Machine Co.

Steel Manganese:
Hadfields Ltd.
Hull Iron & Steel Foundries Ltd.
Canadian Steel Foundries, Ltd.

Steel Plate Construction — Light and Heavy:
Hendrick Mfg. Co.
The William Kennedy & Sons, Ltd.

Steam Engines — See Engines Steam:

Steam Traps:
Canadian Sirocco Co., Ltd.
Laurie & Lamb.

Steel-Tool:
N. S. Steel & Coal Co.
Hadfields, Limited.

Stone Breakers:
Holman Brothers, Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Denver Rock Drill Mfg. Co.
Herbert, Alfred, Limited.

Stone Quarrying Machinery:
Canadian Ingersoll-Rand Co., Ltd.
Denver Rock Drill Mfg. Co.
Sullivan Machinery Co.

Structural Steel Work — Light:
Hendrick Mfg. Co.
The William Kennedy & Sons, Ltd.

Sulphate of Copper:
The Mond Nickel Co., Ltd.

Surveying Instruments:
C. L. Berger.

Switches:
Canadian Steel Foundries, Ltd.

Tables — Concentrating:
Mine & Smelter Supply Co.

Tanks:
Hendrick Manufacturing Co.

Tanks — Acid:
Hendrick Manufacturing Co.
Ontario Wind Engine & Pump Co.

Tanks — Wooden:
Gould, Shapley, & Muir Co., Ltd.
Ontario, Wind Engine & Pump Co.
Pacific Coast Pipe Co., Ltd.
Mine & Smelter Supply Co.

Tanks, Cyanide, Etc.:
Hendrick Mfg. Co.
Ontario Wind Engine & Pump Co.
Pacific Coast Pipe Co.

Tanks — Steel:
Canadian Ingersoll-Rand Co., Ltd.
Hendrick Mfg. Co.
The William Kennedy & Sons, Ltd.

Tanks — Oil Storage:
Hendrick Manufacturing Co.

Tanks — Water & Steel Towers:
Hendrick Manufacturing Co.
Ontario Wind Engine & Pump Co. Ltd.

Tires — Auto, Truck and Bicycle:
Canada Foundry & Forgings, Ltd.
Gutta Percha & Rubber, Ltd.
Hadfields, Ltd.
Powley & Moody, Limited.

Track, Manganese Steel:
Canadian Steel Foundries, Ltd.

Trackworks — (Manganese-Steel):
Hull Iron & Steel Foundries, Ltd.
Canadian Steel Foundries, Ltd.

Tramway Points & Crossings:
Hadfields, Limited.

Transformers:
Northern Electric Co., Ltd.

Transmission Appliances:
Jones & Glassco, Regd.

Transmission Machinery:
Link-Belt Limited.
Hans Renold of Canada, Ltd.
Jones & Glassco, Regd.
The William Kennedy & Sons, Ltd.

Troughs (Conveyor):
Hendrick Mfg. Co.

Trucks:
Hammant Steel Car & Eng. Works.

Tubs:
Hadfields, Limited.
Powley & Moody, Limited.

Tube Mills:
Canada Foundries & Forgings, Ltd.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
The William Kennedy & Sons, Ltd.
Mine & Smelter Supply.

Tube Mill Balls:
Canada Foundries & Forgings, Ltd.
Holman Bros., Ltd.
Herbert, Alfred, Limited.
Hull Iron & Steel Foundries, Ltd.
Peacock Brothers, Ltd.
The William Kennedy & Sons, Ltd.

Tube Mill Liners:

Turbines — Waterwheel:

Turbines — Steam:
Laurie & Lamb.
The William Kennedy & Sons, Ltd.

Turbines:
Belliss & Morcom, Ltd.
Laurie & Lamb.
Herbert, Alfred, Limited.
Hull Iron & Steel Foundries, Ltd.
Peacock Brothers, Ltd.
The William Kennedy & Sons, Ltd.

Turbo Blowers & Compressors:
Canadian Ingersoll-Rand Co., Ltd.

Uranium:
Everitt & Co.

Vacuum Pumps — see Pumps, Vacuum:

Ventilating Systems:
Canadian Sirocco Co., Ltd.

Vises:
The William Kennedy & Sons, Ltd.

Water Jet Drifting Drill:
Canadian Ingersoll-Rand Co., Ltd.
Sullivan Machinery Co.

Wheels and Axles:
Hadfields, Limited.
The William Kennedy & Sons, Ltd.

Winches — Power Driven:
Canadian Mead-Morrison Co.

Winding Engines — Steam & Electric:
Canadian Ingersoll-Rand Co., Ltd.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Anglo-Canadian Wire Rope.
Canada Wire & Cable Co. Ltd.
Greening, B. Wire Co.

Wire:
Anglo-Canadian Wire Rope.
Greening B., Wire Co.

Wire (Bare and Insulated):
Canada Wire & Cable Co., Ltd.
Standard Underground Cable Co. of Canada, Limited.

Wire Rope — see Cable:
Allan, Whyte & Co., Ltd.
Anglo Canadian Wire Rope.
Canada Wire & Iron Goods Co.
Dominion Wire Rope Co., Ltd.
Greening, B. Wire Co.
Northern Electric Co., Ltd.

Wire Rope Fittings:
Anglo Canadian Wire Rope.
Canada Wire & Iron Goods Co.

Wire Cloth:
Greening, B. Wire Co.
Canada Wire & Iron Goods Co.

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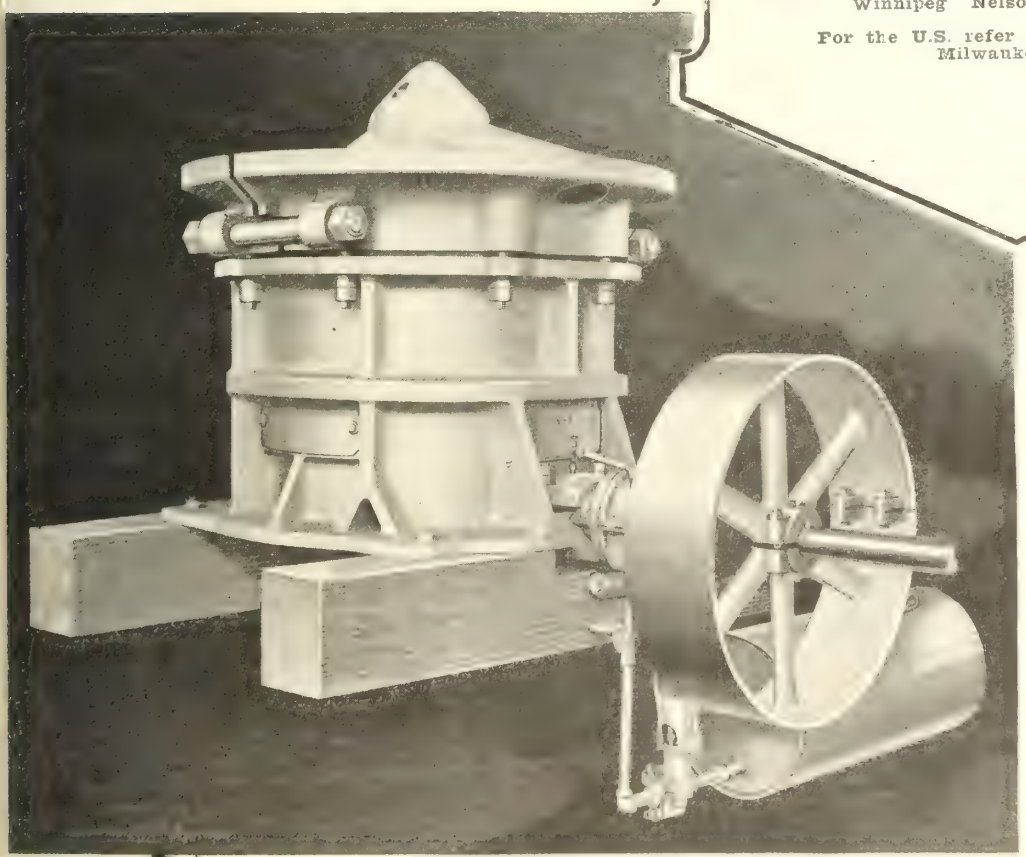

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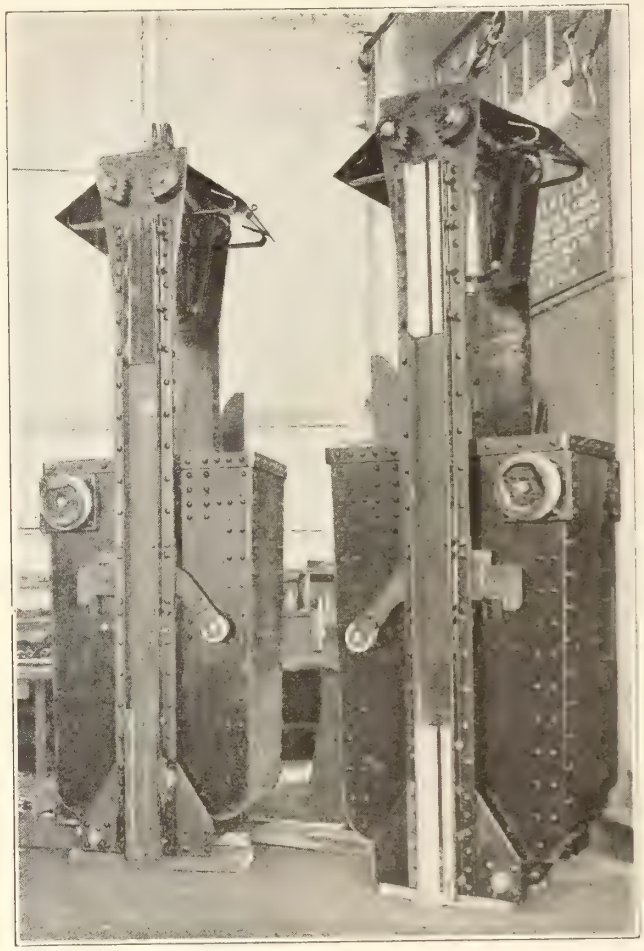

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Ontario's Minerals

PROVINCE OF ONTARIO

Hon. CHARLES. McCREA, Minister. DEPARTMENT OF MINES *Thos. W. Gibson*

Mineral Areas

Ontario, with its 407,262 square miles, contains many millions of acres in which the geological formations are favourable for the occurrence of minerals 70 per cent of the area being underlain by rocks of pre-Cambrian age. The phenomenally rich silver veins of Cobalt, Gowganda and South Lorrain occur in these rocks; so also do the far-famed nickel-copper deposits of Sudbury, the gold of Porcupine and Kirkland Lake, and the iron ore of Magpie and Moose Mountain mines.

Economic Minerals

In addition to the above, practically all economic minerals (coal and tin excepted) are found in Ontario: — actinolite, apatite, arsenic, asbestos, cobalt, corundum, feldspar, fluorspar, graphite, gypsum, iron pyrites, lead, mica, molybdenite, natural gas, palladium, petroleum, platinum, quartz, salt, talc and zinc. This Province has the largest deposits on the continent of talc, feldspar, mica and graphite.

Building materials, such as ornamental marble, limestone, sandstone, granite, trap, sand and gravel, lime, Portland cement, brick and tile, meet every demand.

Mineral Production

Preliminary returns show the output of the mines and metallurgical works of the Province for the year 1922 to be worth $62,202,169, of which the metallic production was $38,190,711.

The following figures show the growth of Ontario's mineral industry by five-year periods since 1891 when a Bureau of Mines was first established.

Year.	Value.	Year.	Value.
1891	$4,705,672	1911	$41,976,797
1896	5,235,003	1916	65,303,822
1901	11,831,086	1918 (Maximum war output)	80,308,972
1906	22,388,383	1921	48,128,387
	Dividends.		

Dividends and bonuses paid to the end of 1922 amounted to $28,096,699 for gold mining companies, and $86,238,185 for silver mining companies or a total of $114,334,884.

Mining Regulations

A miner's license costs $5.00 per annum, and entitles the holder to stake out in any or every mining division three claims of 40 acres each. After performing 200 days' assessment work on a claim, patent may be obtained from the Crown on payment of $2.50 or $3.00 per acre, depending on location in unsurveyed or surveyed territory.

Assay Office

The Provincial Assays Office at No. 5 Queen's Park, Toronto, is maintained by the Department of Mines for the free identification of minerals, free assays under the provisions of the Mining Act of Ontario, and also for general assay work as per the Schedule of Charges which may be obtained on application.

Temiskaming Testing Laboratories

The Department maintains, at Cobalt, an ore sampling and testing laboratory which is now prepared to receive parcels of gold ore from 100 pounds upward, and after sampling and assaying the same to pay to the shipper the value thereof, less treatment charges. The purpose is to afford a market for ores extracted by prospectors and others in developing their mining claims, enabling them to obtain funds which they can use for further work and to report on the most satisfactory method of treatment. Fuller information may be obtained on application to the Manager, Temiskaming Testing Laboratories, Cobalt, Ontario

Publications

For list of publications, illustrated reports, geological maps and mining laws, apply to

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Deputy Minister of Mines.
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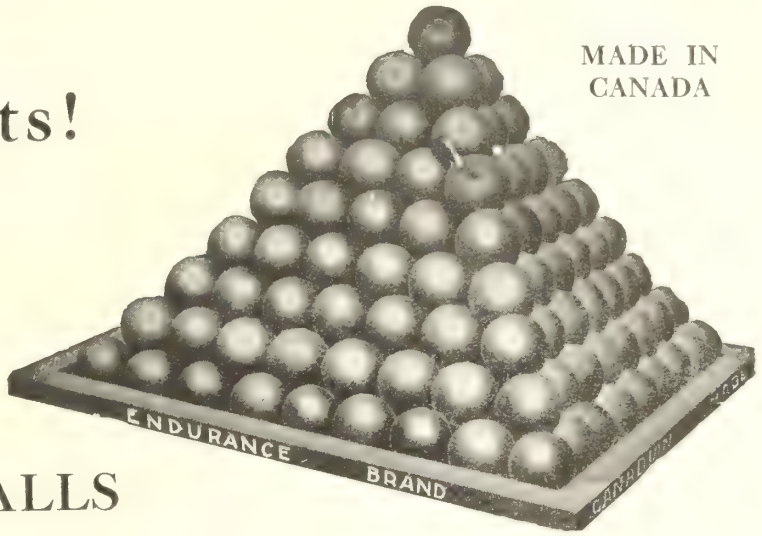

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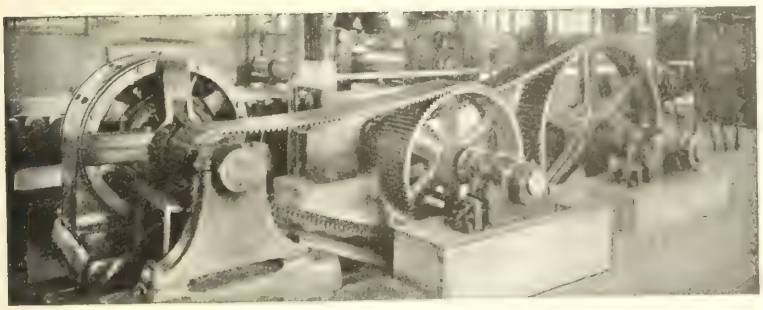

A few of the Morse chains in use at the Raymond Lead plant

Using chain drives speeds up production, cuts belt expense and overtime wages and operates with practically no repairs.

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"When we used leather belts on the hydraulic pumps, if a pump packing suddenly gave way, the water would squirt all over the pump as well as adjoining pumps, causing the leather belts to get wet. This often necessitated a shut-down on 3 to 4 pumps to dry out each belt, thus causing a loss of time by the men, which resulted many times in paying overtime to catch up on the work. Of course, with our Morse Chain Drive we have no such trouble—this positive drive prevents slippage and is not affected by water.

"Leather belts lasted us 2 to 3 years at the most, while our Morse Chain Drives have already lasted 3 to 4 times that long and seem good for many more years. So Morse Drives have cut our expense materially, speeded up production, cut out overtime wages and saved floor space, for they operate on shorter centers."

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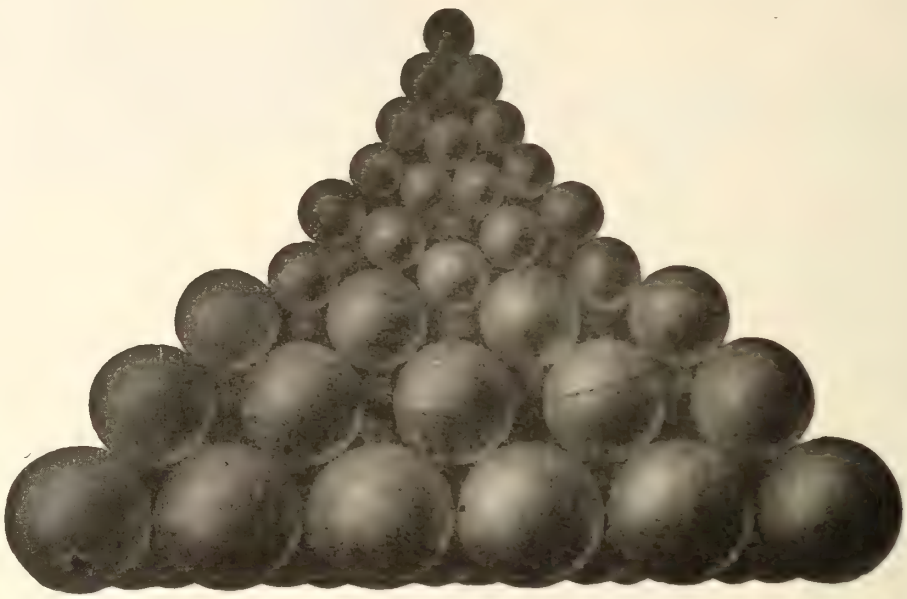

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PUBLISHED WEEKLY

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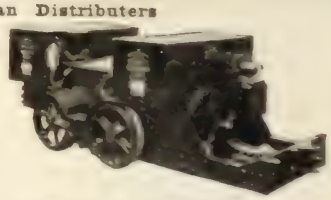

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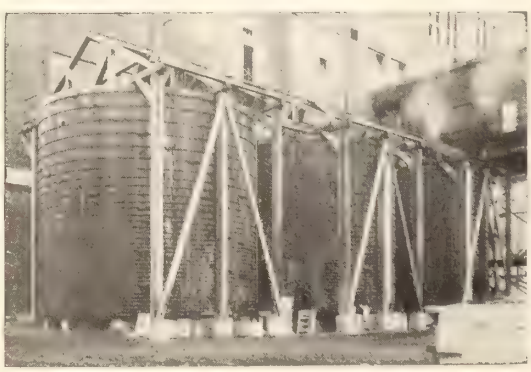

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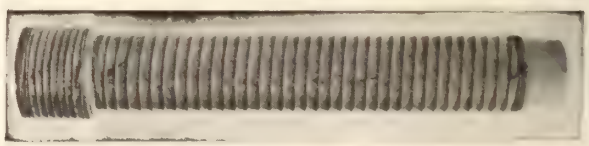

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:-: EDITORIAL :-:

GOLD MINING QUEBEC'S BEST COLONIZER

Last month a farm of 160 acres near Timmins, Ontario, was sold for $20,000. Twelve years ago it was a homestead, with only its proximity to the then little mines, Hollinger and McIntyre, to recommend it. Today the products of its fields and pastures are sold, a couple of miles away, in one of the best markets in Canada.

In the Chelmsford valley, running northwest from Sudbury, is some of the most valuable land for mixed farming in Ontario. Had not the nickel mines and smelters been developed hard by, the farmers would barely find it worth while to till their fields. As it is, the valley is prosperous and the farming land, like its products, sells at high prices.

The valley of the Blanche River, around and north of the head of Lake Temiskaming (the "little clay belt") is now one of Ontario's prosperous farming districts. Without the adjacent mining communities to provide lucrative markets and to stimulate rapid settlement, the farmers of this district would have had a struggling existence for two generations.

There is an active desire on the part of the provincial authorities of Quebec to keep their people within the province, by settling the large areas of good farming land that still are in the grip of the forest. A large proportion of the province's income is being used to this end, and an active and consistent propaganda is being conducted. The effort is resulting well; but the same effect could be had at a fraction of the expense and labour if the aid of the mining industry were secured.

Thousands of Quebec's best colonists are coming across to Ontario annually to settle in the vicinity of the new mining camps. This is of mutual benefit to the settlers and the miners; the settler has at once the best market in the country for his products, and the miner's table and pocket book both show a corresponding benefit. Ontario is benefiting doubly from the discovery and development of her mineral resources; there is the direct profit from the mines, represented tangibly in mining taxes, and there is also the settlement of the land that invariably accompanies the mining operations. In addition, more remote parts of the province are benefited through the increase in trade in commodities of all sorts; manufacturers, merchants, professional men — all derive a profit from the new development.

The provincial administration at Quebec obviously do not understand the importance of mineral development in the general development of the province. They have been generous, even lavish, in their provision for colonization. They are starving their Bureau of Mines, which is responsible for mineral development. In 1909, when the Bureau was reorganized on its present basis, its income was $14,000. Today its income is $16,500. During these fourteen years the Province's mining industry has increased fourfold in annual production; ten per cent. has been added to the Bureau's income.

The Bureau of Mines is manned by a Superintendent, his assistant, and three clerks, one of whom is now on detached duty as mining recorder and hence unavailable for service at headquarters. The Deputy Minister of Mines is likewise the deputy for Colonization, Forests and Fisheries, with the result that the Bureau of Mines gets little or none of his time.

The Superintendent and Assistant Superintendent of Mines assess mining taxes and collect them; they inspect the mines and investigate all fatal accidents; they collect and compile the mineral statistics and prepare the annual report of the Bureau; they attend to the Bureau's extensive correspondence; they formulate policies and advise the Government on appropriate action; they conduct the province's geological surveys. How can two men do all this? They can't.

The Bureau of Mines at Quebec, and the province's mining industry, are suffering from malnutrition; they are being starved. Neither will grow in the natural way until more funds are provided.

The province's present revenue from its mining industry is being diverted to other purposes. About ten per cent. of it is used to maintain the Bureau of Mines. Little or none is used for roads and other such aids to mining development. True, last spring roads were promised for the new gold districts of northwestern Quebec; but these promises have since been "re-considered," and no roads are available. **Ninety per cent. of the province's income from mines is diverted to other purposes.**

Let us compare this with Ontario's practice, which has been successful in developing a mineral industry that today is prominent in the world of mining. Approximately one-third of the province's income from the mines is expended in administration, one-third is put into roads and other such aids to development, and one-third is added to the general funds as profits from a wasting resource. The third spent on maintenance supports a Deputy Minister and his statistical

staff; a Provincial Geologist, three permanent assistant geologists and half-a-dozen additional geologists during the summer months; a staff of draughtsmen; a Chief Inspector of Mines and three assistants; a Mine Assessor; a Mining Commissioner; and Mining Recorders in each of the numerous active mining divisions. The mining industry of Ontario is between two and three times the size of Quebec's; compare their administrative staffs. The opportunities for mineral development in Quebec are judged to be at least equal to those of Ontario. What use is the Quebec Government making of these opportunities?

The logical course of action is plain to see. The political administrators in Quebec must change their habit of obstructive parsimony to one of intelligent investment. They must add to the present starvation diet of the Bureau of Mines, that it may grow and flourish. They must provide an income sufficient to appoint a mine assessor, an adequate inspectoral staff, and a corps of first-rate geologists. Messrs. Denis and Dufresne are accomplishing wonders under their present appalling load of duties; but they cannot pretend to cope with the situation until they have the assistance mentioned above.

An adequately staffed Bureau of Mines at Quebec will work wonders in aiding not only the province's mineral development, but its rapid settlement as well.

THE VALUE OF WORK

By the use of the word *work* in these few lines we wish to connote the idea of *labor* — not a mere whiling away of one's time. There are some men who are said to "go to *work*" when they merely, with a pipe in their mouths, indulge in a little make-believe.

We noticed a man, the other day in Montreal, performing what seemed to us an astounding feat. He was standing on a ladder, and, apparently asleep, he was holding a paint-pot in one hand and a brush in the other. A passer-by informed us that he was working, from which we inferred that his work consisted in not falling off the ladder or not dropping his paint-pot or brush, for negative exertion of this kind was all that he was indulging in — "paid by the hour," as our friend, the passer-by, half enviously remarked. He himself, he said, was paid by the job, and, he added, as though it were a grievance, that *he "had* to work." In reality, instead of feeling aggrieved, he should have been thankful.

It is hard to understand why work should have been regarded as man's primal curse. It is really one of his most substantial blessings. There are few men, indeed, who have the strength of character to be beyond the necessity of work. And such men are generally the hardest workers of all. For the man who has sufficient moral stability for his character to be unimpaired by amplest leisure, is, nearly always curiously enough, as it seems at first sight — though, in reality, there is nothing strange about it — one who cannot bear to be idle. But he works without the propulsion of necessity. And it is, as likely as not, from this very circumstance, that his work derives not a little of its charm. He can choose his own branch of work. And, above all, he can choose public work or social work — work for others, and work the primary object of which is not to feed and clothe himself.

Take the case of Mr. Gladstone, for example. Born in a station of life, which rendered any professional or commercial labor on his part superfluous, with everything delightful surrounding him, he yet chose, for his portion in life, work — for others, it is true, but still work of the sternest sort. For he could do in four hours what it took another man a day to do, and he often worked fourteen hours a day! And yet he was exactly the style of man to whom dallying in a library, poring over classical tomes, and all the favorite aspects of that dignified ease, which most men of culture call work, the work of polished idleness, appealed with peculiar force. Indeed, they were his pastimes. For it is a mark of noble souls that, with them, work like life itself, must be treated as a thing that is real and earnest.

Still life is not all work, and work is not all life For our life should be our vocation, and our work should be our avocation, in the strict sense of that much ill-used word — our by-product, so to speak.

"Let me but do my work from day to day
In field or forest, at the desk or loom,
In roaring market place or tranquil room;
Let me but find it in my heart to say
When vagrant wishes beckon me astray,
This is my work; my blessing, not my doom;
Of all who live, I am the one by whom
This work can best be done, in the right way
Then shall I see it not too great, nor small,
To suit my spirit and to prove my powers.
Then shall I cheerful greet the laboring hours,
And cheerful turn, when the long shadows fall,
At eventide, to play, and love, and rest,
Because I know for me my work is best."

SMELTERS' GENERAL BRIQUETTE CORPORATION

Mr. Thomas F. Kelley of Buffalo, New York, has been appointed Manager of The Smelters' General Briquette Corporation specializing in the manufacture of briquettes for smelting purposes — notably from iron flue dust. The new corporation has been organized to succeed the metallurgical department of the General Briquetting Company.

Mr. Ellsworth B. A. Zwoyer of Perth Amboy, New Jersey, has been appointed Manager of The General Fuel Briquette Corporation organized to succeed the fuel department of the General Briquetting Company

Breaking Ground

An Interview with Mr. Nichol Thompson

Mr. Nichol Thompson has just returned from a visit to England. He was one of a delegation of 28 members of the Vancouver Board of Trade representing mining, timber, fishing, agricultural and general business interests, that went over to the Old Country with the object of breaking through the ice of reserve and getting down to a business understanding with the people of Great Britain.

To a man of Mr. Thompson's type, the opportunities thus presented for meeting the leaders of thought and enterprise, and discussing with them the vital questions affecting Empire development and improved relationships, were so important and pregnant with results, as to make the occasion of his visit a matter of public interest.

Mr. Thompson has lived thirty-seven years in Canada, he has been identified with every stage of progress in the West, and this life-work of his has been superimposed upon an intimate knowledge of Old Country traditions and methods, so that he is, to a very marked degree, in a position to voice opinion as to the requirements for mutual understanding.

Mr. Thompson says that as soon as it became known that each member of the delegation was defraying his own expenses, and that no one of them went over with any personal axe to grind, they were assailed by such a storm of enquiries, and found such a receptive attitude towards all the information they could give, as to show on the part of the people of Great Britain as keen a desire to open up, and interchange ideas as that with which they themselves were inspired.

The delegation was in Great Britain seven weeks, and during that period travelled over 2,500 miles. Very wisely the party did not split up into sections but travelled en bloc, thus emphasizing the unity of their purpose and their preparedness to deal with every point of view in the diverse communities that they visited.

Seven hundred individual interviews were held and altogether twenty-one thousand business men were met and addressed. Press recognition was received from over 600 British newspapers and more than 500 enquiries were answered daily. The tour was thoroughly organized, and regular meetings of the Executive Committee were held during the ocean voyage in order to provide for the greatest possible efficiency and team work.

Describing the tour, Mr. Thompson said:—

"The principal meetings commenced with the opening luncheon at the Empire Exhibition Building at Wembley. This luncheon was well attended and we had the honor of being the first public body entertained by the Committee of the Exhibition.

The following day, Empire Day, we were the guests at a luncheon given by the London Chamber of Commerce, and we also attended the Empire Day dinner at the Hotel Cecil, at which Lord Birkenhead presided. Our President, Mr. J. B. Thomson, and I had the honor of speaking.

Next morning we left for Bristol where we were met by the Lord Mayor and City Council, and entertained at luncheon, and were then taken over the Harbour improvements at Avonmouth.

This was the commencement of the provincial tour, during which we visited the Cities of Leicester, Birmingham, Manchester, Northampton, Liverpool, Edinburgh, Newcastle, York, Hull, Sheffield, and Nottingham.

On our return we had the honor of being received by H. R. H. the Prince of Wales, who talked at length with each member of the delegation, and showed the greatest interest in and sympathy with our work and aims. After this reception we motored down to Petersham, and our Native Sons planted seeds of British Columbia trees near the grave of Capt. Vancouver. The First Lord of the Admiralty was present and gave an interesting address.

Large meetings were held and addressed at all the places mentioned above, and we visited many important industrial works, including the Small Arms Factory at Birmingham, Cadbury's Cocoa Works, the Manchester Ship Canal and Terminal Docks, the Midland Car & Wagon Works at Birmingham, the Textile Works at Leicester, the large factories at Nottingham, also Cammell Laird's Railway Equipment Works there, and Vicars Steel Works at Sheffield.

Every effort was made by our hosts to make our tour interesting, and to enable us to gain the best possible insight into conditions of life in Great Britain.

We were motored to Chatsworth, the seat of the Duke of Devonshire, and out to the historical Haddon Hall, and

Mr. Nichol Thompson.

we visited the old Castle at Edinburgh and Hollyrood Palace, and in this city we were entertained at lunch by the Chamber of Commerce, and by the Lord Provost at dinner.

At Newcastle the Lord Mayor and Sheriff showed us every attention, and so it was at every city and town that we visited,—our reception was most cordial. At all our meetings and interviews there was a free interchange of ideas, especially in regard to the best way to stimulate trade within the Empire, and the people generally evinced a very receptive attitude towards our own expressions of opinion.

We discussed at length the question of the better distribution of population, the surplus population of the British Isles, and the surplus acreage in the Overseas Dominions. This was a subject that has evidently been engaging the interest and attention of all classes in Great Britain,—indeed we found very little need for urging a closer attention on the part of the people in the Old Country to the possibilities of the Overseas Dominions, and among the many who showed a keen desire for closer connections we were impressed particularly by the keenness and sincerity of Lord Birkenhead, the Duke of Oevonshire, Mr. Joynson Hicks, Lord Long of Wraxall, and the Premiers of Australia and New Zealand. We came away with the conviction that the key-note for better mutual understanding of one another's point of view is to be found in a closer trade relationship and in the merging of interests, and that all that is required for this purpose is to familiarize people with the facts.

The British capitalist only requires to be shown the importance of establishing works by means of which the natural resources could be manufactured into such shape as would allow of their being shipped at a profit to Great Britain. He already wants to do this; to import semi-manufactured goods that may assist the export trade of Great Britain in finished products. It is important also to encourage the idea of human relationship. What is clearly needed is to get the people of Great Britain imbued with the idea that they themselves, as well as we, are part of the great British Commonwealth, and that when they leave any part of the British Isles for another part of the Overseas Dominions, they are not emigrating or immigrating but simply moving from one part of the country to another. We felt very strongly, as the result of our most interesting tour, that in the encouragement of this feeling we may arrive at the true spirit of human brotherhood that is the highest bond of Empire."

Mr. Thompson was able to point to two practical results of the tour, namely, the inauguration of two new lines of steamers running direct from Bristol and Manchester respectively to Vancouver.

The interests of the mining industry of British Columbia were in the special care of Mr. Thompson, and at his hands they were well served; there was no attempt to force individual attractions upon attention, but rather the policy was adopted of inspiring the thought that British Columbia must be a country with great mineral possibilities, and the interest to ask where and what they are. That success was achieved in the endeavour is evidenced by the fact that the last week of Mr. Thompson's stay was entirely occupied by interviews with all kinds of business men in London to the exclusion of all other prearranged business.

As compared with what he knew twenty-five years ago Mr. Thompson was impressed by the improvement in conditions generally in Great Britain, by a general elevation of thought and expansion of ideas, and an atmosphere of reciprocity in which one may look for a rapid growth of understanding, confidence and goodwill. This is the prime need of the mining industry of British Columbia to-day, and in fostering it,—the delegation of which Mr. Nichol Thompson was a member has earned the country's gratitude.

IMPORTANT APPOINTMENT BY B. E STEEL CO.

The British Empire Steel Company have appointed Frank Lucas head of the department for the sale of coke. This is one of the most important steps ever taken in the history of the Canadian Coal industry and will be watched with intense interest from far and near. To supply the anthracite market of the Maritime Provinces and of Quebec it is the object of the Steel Company. Like all new projects it will at first have a small beginning, but there is no doubt in the minds of those interested in the coal industry but that it will eventually succeed. The quality of the coke supplied may not at first be quite suitable to domestic use, owing to the present construction of the ovens, but it is stated that even with the ovens built for metallurgical purposes a fair quality of coke for domestic use can be supplied. Mr. Lucas is the right man in the right place for he has had considerable experience and a long training in the work of analysing coal, coke and other minerals. He is intensely interested in the work, and we look forward to much progress both in the making and the sale of coke, from Cape Breton coal.

BRICKS FROM OIL SHALE

With the object of obtaining a product cheaper than the ordinary clay brick, experiments have been made in Germany in the manufacture of bricks from oil shale, of which there are large deposits in various parts of the country.

One process that was tried depended on mixing the shale with cement or lime and subjecting it to hydraulic pressure. The result, however, was not entirely satisfactory, because it was found impossible to attain uniformity of quality, owing to the varying contents of lime and pyrites. This process was accordingly abandoned in favour of another which has been tried successfully at the Prussian Geological Institute and at several brickworks. The shales, after the pyrites has been separated from them by sifting, are ground up with a proportion of clay or sand which varies according to the richness of the shales, and the powdered mixture is then moulded into bricks, which are put straight into the kiln without being dried. No fuel is required to burn them, as the inherent content of oil in the shales suffices for that purpose. Bricks made in this way are said to be slightly lighter in colour than ordinary bricks, but to be no different in appearance otherwise. A mixture of oil shale and clay has given bricks which contain only small amounts of calcium sulphate and sulphite and can stand a pressure exceeding 1,000 lb. per sq. in. Their strength is thus sufficient for ordinary house-building, and may, it is thought, be increased by improvements in the process.—Ex.

PERSONAL

Mr. James Bartlett, who has been with the Ontario Department of Mines since 1914 as inspector of mines, resigned on September 1st to become associated with the Coniagas Mines at Cobalt. Mr. Bartlett at the time of his resignation was in charge of the Sudbury district.

Natural Gas and Petroleum Resources of Western Canada

Recovery of Natural Gasoline by the Charcoal Absorption Method

By NEWTON W. EMMENS

The most recent development and improvement in the recovery of gasoline contained in natural gas is the use of activated charcoal as the absorbent medium in place of oil. By this improvement not only is the operation of the plant simplified, but the percentage of recovery is greatly increased.

The Discovery of Activated Charcoal

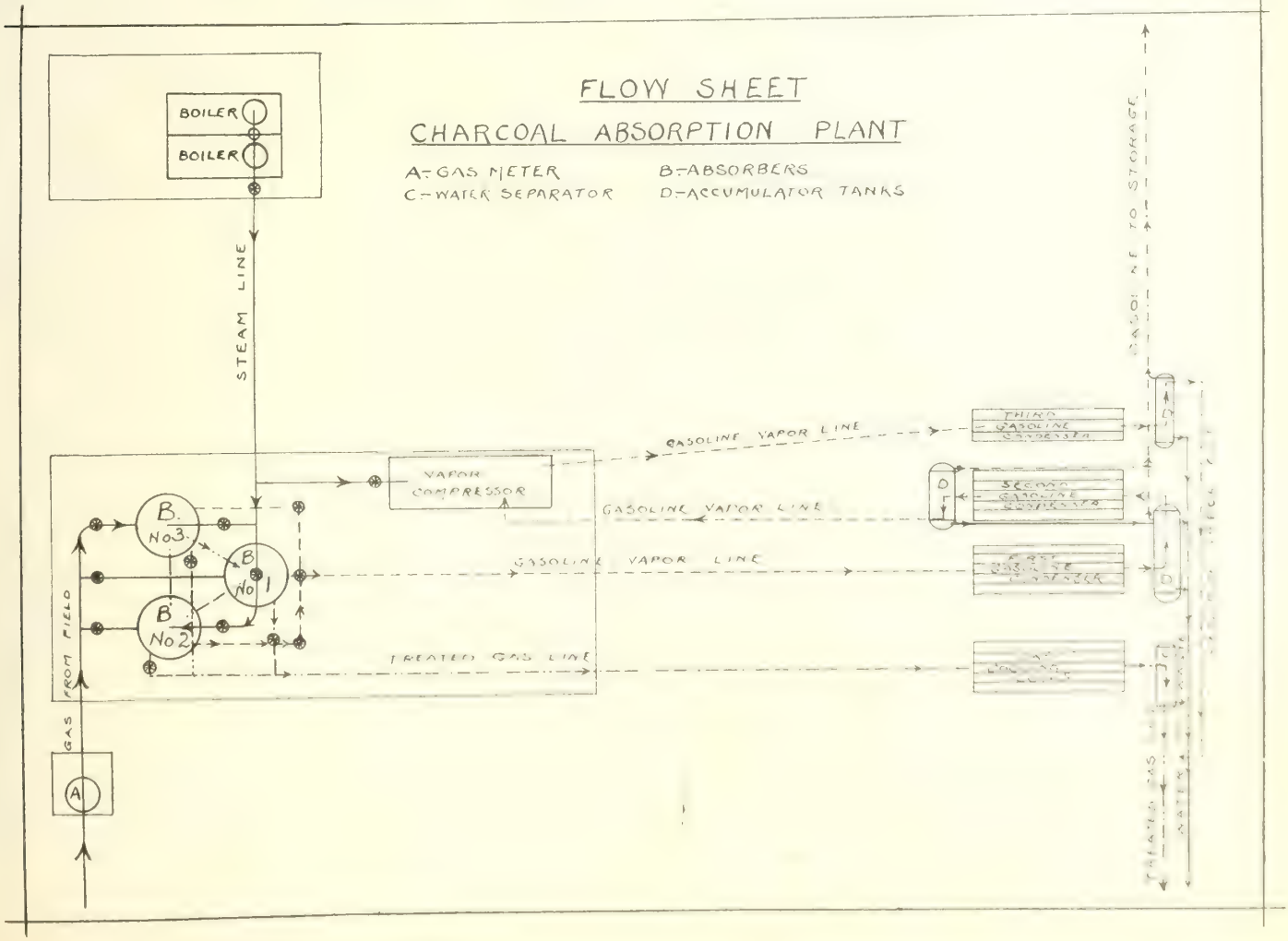
The charcoal used in this process is manufactured by a long and complicated process from cocoanut shells to meet the particular requirements of gasoline absorption and is subjected to a series of laboratory tests before being approved for use in the commercial plant. The charcoal is crushed into pieces about the size of wheat grains and has the power of absorbing, through the microscopic capillaries each grain contains, liquids and gases. There are several types and grades of activated charcoal on the market, but one type has been found to make the greatest recovery of the gasoline contained in natural gas. This particular type of activated charcoal will absorb 15 to 20 per cent. of its own weight in marketable gasoline.

The development of the charcoal absorption process is the result of investigations, carried out by G. A. Burrell and G. G. Oberfell during the war, concerning substances that could be used in gas masks for absorbing poisonous gases. Since the close of the war the investigations have been continued and the knowledge obtained has been put into practical use for the treatment of natural gas. Its commercial application, and the development of the plant details are due to the work of C. L. Voress, V. C. Canter and R. W. Skoog.

Data Obtained by Testing

To obtain the data necessary for designing the plant, the gas to be treated must be accurately measured, and analyzed and its gasoline content determined by means of absorption with the same type and grade of charcoal to be used in the commercial operation, because upon the density of the gas, its velocity, latent heat, and gasoline content depends the size of the absorber and the internal arrangement. The apparatus required to make these tests is very much simpler, less expensive, and more easily carried from place to place than that required for tests by either the compression or oil absorption method described in my previous article. It consists of an effusion apparatus for taking the gas density, a Pitot tube, a gas meter, a U tube, absorbers filled with charcoal, and a stop-watch.

The determination of the gas density by effusion is based upon the fact that the times required for the escape of equal volumes of two gases under the same pres-



sure, through the same small orifice, are approximately proportional to the square roots of the densities of the gases. The densities, or weights, are therefore proportional to the square of the times of effusion. The specific gravity of a gas is the ratio of the weight of a given volume of the gas to the weight of an equal volume of air, measured at the same temperature and pressure. The apparatus used by the author is known as the "Schilling Apparatus" and consists of a glass jar 3 1-2 inches in diameter by 12 inches deep, closed by a brass cap through which is inserted a graduated glass tube, one inch in diameter. This graduated tube is mounted in a brass casing, slotted for the observation of the water column, and capped with a three-way cock and small protected glass tip into which is fused an orifice plate made of platinum-iridium alloy.

Gas Density Test

The method of making a test is as follows: The large glass jar is filled with clear water to just above the upper graduation on the inner tube. This tube is then filled with air and the three-way cock opened so as to allow the air to escape through the little orifice plate in the glass tip, and the number of seconds required for the water level to rise from the lower to the upper mark in this tube is carefully noted. This test should be repeated several times and the average of the readings taken as the time required for the air to pass through the orifice plate. Having done this, the next step is to connect the side opening of the three-way cock with the gas supply, by means of a rubber tube. The gas is then turned on carefully and allowed to expel the water from the inner tube and bubble up through the water in the outer jar, letting it run for several minutes so as to be sure that all the air in the inner tube has been replaced by gas. The three-way cock is then turned so as to shut off the gas supply and allow the gas in the inner tube to escape through the little orifice, and the time that it takes the water to rise from the lower to the upper mark is carefully noted, as was done in making the air test. Repeat this several times and record the average as the time required for the gas to pass through the orifice. Square these two results and divide the gas time by the air time, the result being the specific gravity of the gas, air being one. For example, if it took 160 seconds for the air, and 129 seconds for the gas to pass through the orifice, we should have 16,641 (square the gas time) divided by 25,600 (square of the air time), which gives us 0.650, the specific gravity of the gas as compared with air.

Apparatus for Absorption Test

The specific gravity of the gas is required in order to know how many cubic feet to pass through the little absorber in making the test for its gasoline contents, because the correctness of this method of testing depends upon the saturation of the charcoal, which should be such that on distillation about 25 cc. of gasoline are recovered. For example, a gas tested by the writer, having a specific gravity of 0.82, yielded 25 cc. of gasoline from the charcoal after 10 cubic feet of the gas had been passed through the absorber, while a gas having a specific gravity of 0.64 required the passing of 35 cubic feet through the absorber before the charcoal was saturated sufficiently to yield 25 cc. on distillation.

The charcoal absorbers used in testing natural gas consist of a metal tube 1-⅛ inches in diameter by 10 inches long, containing a perforated disc fitted inside the tube near one end, and closed at either end by a screw cap. The absorber is filled with activated charcoal of the proper type and grade, which must be perfectly dry, as the presence of moisture impairs the ability of the charcoal to absorb gasoline vapors.

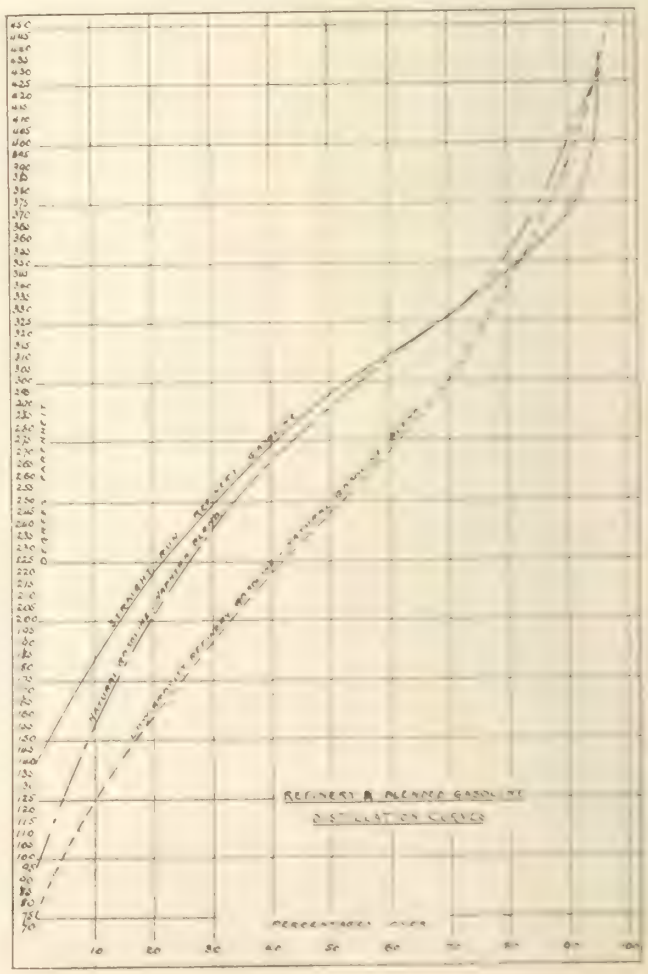
The Absorption Test

In making a test, the gas from the well first passes through the meter and then through the little absorber, at atmospheric pressure and at a speed of about twenty cubic feet per hour, until the estimated quantity has been passed, after which the absorber is disconnected, capped, and taken to the laboratory, where the gasoline is distilled off and measured. When testing gas in a new field it is well to make several absorption tests, one using the estimated quantity of gas based on its specific gravity, and others using greater and smaller quantities, taking as the correct result the number of feet yielding gasoline, on distillation, closest to 25 cc., and from it calculating the gasoline content of the gas.

The charcoal testing method shows a greater yield of gasoline than any other direct testing method, when the tests are properly conducted with the correct grade of charcoal, but it does not show the maximum saleable product recovered when the gas is treated in a charcoal absorption plant.

Commercial Absorption Plant

The commercial plant consists of meters for measuring the gas, absorbers, condensers, accumulator tanks, vapor compressors, storage tanks, steam boilers, electric light plant, pumps for supplying the water for the boilers and condensing coils, chemical fire extinguishers, laboratory, and, in some installations, a blending tank. In these plants three absorbers are used alternately so that while one absorber is being charged with gasoline, the second is having its gasoline content distilled off, and the third is having its charcoal cooled preparatory to re-charging with gasoline.



The cycle of operation in these absorbers is as follows: Assuming that No. 1 absorber has just had its gasoline distilled off, that No. 2 is charged with gasoline and that No. 3 is ready to be charged; then the gas as it comes from the field is turned off from No. 2 absorber and into No. 3, steam is turned into No. 2, and the gas as it comes out of No. 3, being denuded of its gasoline, is turned through No. 1. The steam, on coming in contact with the charcoal, partially condenses, and drives out the gasoline that has been absorbed, replacing it with water vapor at a high temperature and at the pressure of the steam.

The vaporized gasoline and some of the steam pass on to the condensing coils. After the gasoline has been driven out, the charcoal is hot and filled with water vapor, so it is necessary to cool it and get rid of this water before the charcoal will be in a condition to absorb a fresh charge of gasoline vapor. This is accomplished by means of the treated gas which, while being stripped of its gasoline vapors, still contains ethane, propane and some butane that are not condensed to a liquid at the temperature of the gas, and at atmospheric pressure. This gas, on coming in contact with the hot charcoal, cools it, replacing the absorbed moisture with hydrocarbon gases, so that at the end of the cycle the charcoal is at the temperature of the flowing gas, has its capillaries filled with it, and is ready to absorb another charge of gasoline. This treated gas, together with the moisture taken up from the charcoal, goes to a cooling coil where the water is precipitated, thence through a separating tank and into the gas lines leading out of the plant.

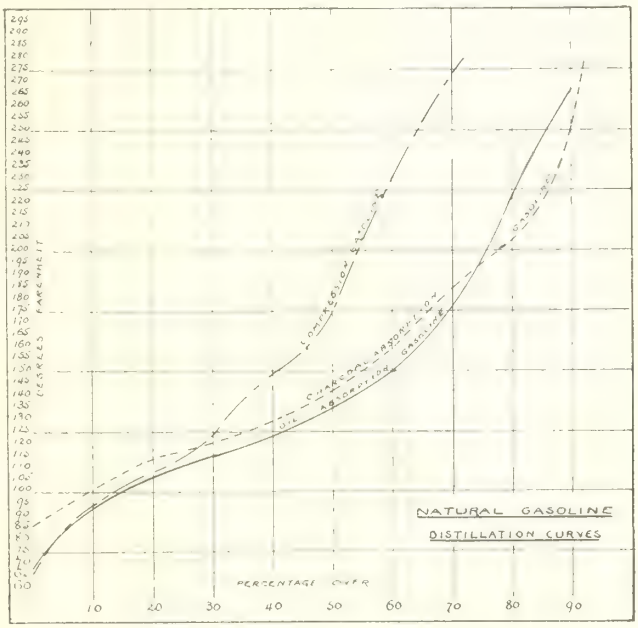
Separation of Gasoline and Water Vapor

The steam and gasoline vapor from the absorber being distilled go to the first condensing coil, where all the water and some of the gasoline are condensed. The condensate goes to an accumulator tank where the water and gasoline are separated, the former going to waste and the latter to the storage tanks. The uncondensed vapors from this first condensing coil go to a second, where they are subjected to a lower temperature and additional gasoline is recovered. From here the residual vapor goes to the compressor, where its pressure is raised, and thence to the third set of coils where the remaining condensable gasoline vapor is recovered.

The efficiency of the charcoal plant is high, and it is commercially practicable to recover 100 per cent. of the gasoline contained in the gas, and, owing to the selective absorption properties of the charcoal, the quality of the product can be made to conform to the requirements of the market, without sacrificing efficiency, which cannot be done with the other processes.

Blending of Natural Gasoline

The gasoline obtained from natural gas by the processes described is not so well suited for use in gasoline engines (except for aviation purposes) as that made by the distillation of petroleum, because natural-gasoline contains a larger proportion of the low boiling-point fractions and a smaller proportion of the high; consequently the vaporization losses while the liquid is in storage are high, particularly in a hot climate. To overcome this difficulty the natural-gasoline is mixed with either naptha or low-gravity refinery gasoline. These mixtures, if properly made, yield a gasoline admirably suited for use in motor cars, and by varying the proportions of the natural gasoline and blending material, a motor gasoline can be produced that will give the maximum power under any climatic conditions. For example, in a country where the temperature never falls below 60 deg. F. and goes above 100 deg F., a gasoline having an initial boiling point of 140 deg. F., and an end point (that is the temperature at which the last drops distil) of 437 deg. F. is an excellent motor fuel, with reasonable storage losses; but such a gasoline would not give good results in a cold climate because of the difficulty of starting the engine without pre-heating. A natural-gasoline blend, however, with an initial boiling point of 95 deg. F. and an end point of 428 deg. F. makes a very satisfactory material, and a cold automobile engine will start readily on such a fuel even in zero weather. The accompanying curves from the distillation of gasolines and blends (made in accordance with the recommendations of the U. S. Bureau of Standards) show graphically the volatility of each.



Type of Buildings Required

In the treatment of natural gas for its gasoline content, temperature plays an important part with the oil absorption process, not only in regard to the percentage of extraction but also in regard to the quantity of gas used for heat and power purposes, and in the circulation of the absorption oil. In a country where the winter temperatures are low, such as in Alberta, particular attention should be paid to the type of buildings erected for the housing of the machinery and in the insulation of the absorbers, oil storage tank, vent tank, still, and oil lines, because the absorption oil becomes quite thick when chilled, making it difficult, and often impossible, to circulate satisfactorily. This, of course, adds to the expense of installation.

The charcoal process is not open to the same objection, because there is no oil to circulate and the absorbers, being comparatively small, do not require as much insulating material nor material of such a high grade, because they are housed within a building.

The type of building used depends upon the location of the plant, but it should of course be as nearly fire proof as possible and should be warm in winter and cool in summer. If sand and gravel can be obtained locally at a reasonable price, there is nothing better than a reinforced concrete building of the Van Guilder type, which is essentially a double-walled structure with an air space enclosed between the walls. No special forms are needed for this type of structure, nor is skilled labor required, as anyone who can handle a shovel and a tamping rod can do a very satisfactory job. The building is roofed with steel pur-

The Author testing natural gas for gasoline by the charcoal absorption method, at a gasoline plant in West Virginia.

lins and either corrugated iron, or asbestos sheets, preferably the latter.

Another type of building is the sectional iron structure, lined with some non-inflammable material such as plaster board.

Cost of Buildings

With cement costing $3.10, per barrel, sand $4.70 per yard, and gravel $4.55 per yard, delivered at the site where the buildings were erected, and with labor at $3.50 to $4.50 per day of nine hours a building 20 ft. × 25 ft. of the double-wall concrete construction cost, complete including floors, $1,388, as against $1,458 for a sectional steel building of the same dimensions, but unlined.

The only argument in favor of the sectional steel building is its salvage value after the gas field has become exhausted, which would be about 20 per cent. at the end of ten years if the buildings has been kept properly painted and reasonably cared for. Against this salvage value for the steel building is the saving in fuel for heating, the increase in the efficiency of the plant due to uniformity of temperatures, savings in general repairs and painting, and lessened insurance costs in favor of the concrete structure.

Cost of Absorption Plant

It is not possible to give an exact estimate of the cost of an absorption plant in Alberta without knowing labor costs, freight rates, duty, the cost of hauling and excavating and other items that are governed by local conditions, but it would probably be between $130,000 and $160,000 for a plant to handle 10,000,000 cubic feet of gas per day containing 500 gallons of gasoline per million cubic feet, thus providing an output of 5,000 gallons per day of marketable gasoline.

To operate such a plant would require nine operators, using eight-hour shifts with three men on a shift, in addition to a chemist, one man to load tank cars and generally to help at odd jobs, and a superintendent. Allowing for good wages and salaries (considerably higher than is being paid in the United States) and an ample allowance for supplies and minor repairs, the operating expense would not exceed $3,000 per month.

Value of Gasoline Recovered

The output from such a plant would be 150,000 gallons of gasoline monthly, worth about 15 cents per gallon under normal conditions, or a total of $22,500. At present, owing to the temporary over-production of crude oil and gasoline, the market price of natural-gasoline is about 8 cents per gallon, which would make such a monthly output worth $12,000. These figures are based upon the supposition that the gas cost the plant nothing; that is, that the owners of the gas field built the plant and after extracting the contained gasoline, sold the residual gas or manufactured it into some article of commerce, such as carbon-black. If the plant were charged up with the value of the gas converted into gasoline and burned in the operation of the process, such expense would be added to the $3,000 monthly operating cost. Making ample allownace for leaks and sundry losses, this would require approximately 10,000,000 cubic feet of gas monthly for an output of 150,000 gallons of gasoline, and this at 8 cents per thousand cubic feet would be worth $800, making a total expense of $3,800.

So far as the gas fields of east central Alberta are concerned the important problem is to know what to do with the gas after extracting the gasoline, as there is no domestic, or industrial market for it, nor can there be for many years to come. Such a market requires a large urban population. Nevertheless, it cannot be allowed to go to waste by blowing it into the air.

To make carbon-black from it is one solution, which will be discussed in the next article.

PETROLEUM PARAGRAPHS

The McMurray Asphaltum & Oil Co., Limited, is developing actively its tar-sand properties near McMurray on the Athabaska river. From the bitumen extracted from this sand a paint is being manufactured which is particularly suitable for protecting iron and steel from rust. It is to be used to paint the gas pipe-line now being laid from the Viking field to Edmonton, Alberta.

In addition to extracting bitumen, the McMurray Asphaltum & Oil Co. are recovering an oil from this tar sand, of 19 deg. Be. gravity. The sand contains: gasoline 5 per cent.; kerosene 3 per cent.; gas oil 28 per cent.; lubricating oil 44 per cent.; asphalt residue 20 per cent. The oil contains some sulphur, which is giving a little trouble in the producing of a satisfactory water-white kerosene, but this difficulty will be overcome in due course.

It is believed that the products of these tar sands will ultimately displace the asphalt now imported from Trinidad and willl be increasingly used for road making in Canada. Tests are now being made by the University of Alberta on the utilization of this material for road building, with most encouraging results.

From the Fort Norman field it is reported unofficially that the discovery well is now good for 75 barrels of oil a day, and that the well is shut in at present so as to conserve the oil until such a time as it can be used. The results of the drilling of the Bear Island and "C" camp wells are said to be encouraging, both wells showing oil but no large production.

Sufficient work has been done in the Fort Norman field to prove the existence of oil in large quantities; but under present conditions of transportation and oil prices

it cannot be made of commercial use and the tremendous expenditure necessary to provide a means of bringing the oil out is not justified at present. It is, however, a good thing to have it in reserve and to know that the oil is there when needed.

In the Sweetgrass section of southern Alberta the Imperial Oil Company's well in Sec. 5, Tp. 1, R 16, west of the 4th mer., has been drilled to a depth of 2,700 feet without getting oil in commercial quantities, although it was carried through the Madison sands. The well is to be abandoned and the casing pulled. In other sections of the Sweetgrass district "shows" of oil are reported in the drilling wells, but not in commercial quantities, thus far. Drilling still continues.

In east centel Alberta the well drilled near Birch Lake, in Tp. 50, R. 12, west of the 4th mer., is reported to have struck a commercial flow of oil at a depth of 2,200 feet.

In the Irma-Wainwright field the No. 2 well of the British Petroleums is drilling at 1,600 feet and the No. 2 Grattan of the Imperial Oil Co., at 2,000 feet.

The Irma Oil Development Co. have finished their water well and are drilling for oil and gas in Sec. 28, Tp. 45. R. 9, west of the 4th mer.

In the Viking field the work of connecting up the wells and the laying of the pipe-line to Edmonton is making good progress. Deliveries of pipe are being made promptly, much of it coming from Great Britain by way of the Panama Canal and the port of Vancouver.

Canada's New Patent Act

An Explanation of the Important Changes

By H. MACDONALD, Legal-Secretary, Canadian Manufacturers' Association, in "Industrial Canada."

Manufacturers' Association, in "Industrial Canada."

The new Patent Act enacted in the last session of the Dominion Parliament, and which by proclamation of the Governor-in-Council came into force on Sept 1st, 1923, contains many provisions radically different from those in the old Act. The principal changes have to do with the conditions an applicant must fulfil in order to obtain a patent, and with which he must comply in order to maintain his patent in force. The prohibition against importation of the patented invention after one year from the date of the patent is removed and new manufacturing and licensing provisions introduced.

The former Patent Act, in its main provisions, has remained substantially unchanged since 1869, when it was drafted, with the United States Act of 1836 as a model. Since that date, the only material change that has been made has been the introduction in 1903 of the compulsory license system as a substitute for workings with respect to certain classes of inventions.

The International Convention

There has been a growing sentiment that the Canadian Patent Act should be amended in order to permit Canada to become a member and so secure the advantages of the International Convention for the Protection of Industrial Property (signed at Paris, March 30th, 1883; revised at Washington, June 2nd, 1911). The principal advantage to be obtained by the Convention is that contained in Article 4 thereof, which provides: "Any person who has duly applied for a patent, industrial design or model, or trade mark in one of the contracting states shall enjoy, as regards registration in the other states and reserving the rights of third parties, a right of priority during the periods hereafter stated."

The period stated with respect to patents is one year. Canada under its former Act, gave the same protection as the Convention did to all foreign applicants, but received nothing in return. The principal bar to Canada hitherto becoming a member of the Convention has been that contained in Section 38 of the former Patent Act, which prohibited importation after one year, this being contrary to Article 5 of the Convention.

The revision of the working requirements contained in the new Act will enable Canada to become a member of the Convention, with the result that inventions by Canadian inventors will be protected during a period of one year in all countries of the International Union. These countries include, at the present time, Austria, Belgium, Brazil, Cuba, Denmark, Dominica, France, Germany, Great Britain (with Australia, Ceylon, New Zealand, Trinidad, and Tobago), Holland, Hungary, Italy, Japan, Mexico, Norway, Portugal, Serbia, Spain, Sweden, Switzerland, Tunis, and the United States.

Revised Conditions

The conditions imposed on an applicant for a patent have been revised in the new Act as follows:

"7 (1) Any person who has invented any new and useful art, process, machine, manufacture or composition of matter, or any new and useful improvements thereof, not known or used by others before his invention thereof and not patented or described in any printed publication in this or any foreign country more than two years prior to his application and not in public use or on sale in this country for more than two years prior to his application may, on a petition to that effect, presented to the Commissioner, and on compliance with the other requirements of this Act, obtain a patent granting to such person an exclusive property in such invention.

"(2) No patent shall issue for an invention which has an illicit object in view, or for any mere scientific principle or abstract theorem."

The principal changes are (a) with respect to prior knowledge in other countries than Canada; (b) with regard to prior publication; (c) with regard to public use or sale prior to application.

Former Act Rigorous

Under the former Act the requirements which an applicant for a patent had to fulfil with regard to prior knowledge were more rigorous than any other country in the world. To be entitled to a patent in Canada, under the former law, the applicant had to be the first inventor throughout the world, and not merely in Canada. This made a Canadian patent liable to attack

by proving that, prior to the date of the alleged invention, it was, as a matter of fact, known in some way to some other person in some other part of the world. The phraseology of the former Act was particularly comprehensive in requiring that the invention should not be "known or used by any other person before his invention thereof." The new Act substitutes "not known or used by others in Canada before the invention thereof." By the new Act, not only is knowledge restricted to Canada, but it is required to be knowledge "by others," not "by any other person." This phraseology has been construed in the United States courts to exclude secret knowledge, such as an unpublished drawing or prior model.

The new Act makes publication for more than two years in Canada or any foreign country a bar to the application for a patent.

The new Act also introduces a prohibition against public use or sale in Canada for more than two years, and makes no reference to whether or not the public use or sale was with the consent or allowance of the inventor or not.

Section 8 of the new Act extends the time within which application may be made on an invention for which a foreign patent has been taken out until two years from the date of application of the foreign patent, as compared with one year from the date of issue in the former Act. The corresponding section in the United States permits application within one year from the date of application in a foreign country, for which protection is afforded by the International Convention.

Explanations of Sections

Section 16 contains new law and follows exactly the terms of Section 11 of the British Patents and Designs Act, 1919. It provides, in brief, that in the case of patents on chemical processes no claims shall be made for the substance itself except when prepared by the special process described, and further, that in the case of inventions maintained for the preparation or production of foods or medicines, the Commissioner may grant a license to any person applying for the same, upon such terms and conditions as may be settled by him, having regard to the desirability of making the food or medicine available to the public at the lowest price consistent with giving to the inventor due reward for the research leading to the invention. The enactment of this law in Great Britain is too recent to enable any opinion to be formed as to its effect.

Section 24 introduces new law with regard to invention made by persons in public service, and is a restriction upon the rights of such persons.

Section 27 of the Act, with respect to the re-issue of patents, has been amended, but limits the time within which application for re-issue should be made to four years from the date of the patent.

Section 40 sets out the specific conditions under which any patent, except those governed by Section 24, is subject, respecting the manufacture of the patented article, for the reasonable requirements of the public, all questions regarding which may be determined by the commissioner or on reference to the Exchequer Court.

The right of the Government of Canada with regard to a patented invention is covered by Section 48, which reads: "The Government of Canada may, at any time, use any patented invention, paying to the patentee such sum as the Commissioner reports to be a reasonable compensation for the use thereof, and any decision of the Commissioner under this section shall be subject to appeal to the Exchequer Court.

Summed up briefly, it may be said that the provisions of the new Act are more liberal in the consideration extended to inventors. Amongst the most important departures from the old legislation are extension of the time limit set for the manufacture of the patented device; provision for one partner in an invention to secure a patent upon it under certain conditions; making registration of patent attorneys obligatory, and reducing the amount of fees, and the danger of allowing the patent to lapse through failure to pay a second fee instalment. Inventors and manufacturers will thus be given a better opportunity to develop inventions to a commercial stage than under the rigid manufacturing and importation requirements of the old Act, and in the end Canadian industries will be benefited more by the resulting commercial development than by any advantages formerly obtained from forfeiture.

PLATINUM AND PALLADIUM AT SHEBANDOWAN

In *Summary Report*, 1922, *Part D*, of the Geological Survey there is a short report by T. L. Tanton on the nickel deposits at Shebandowan Lake, 50 miles west of Port Arthur, on the Canadian National Railway. The deposits are held by J. C. Cross of Port Arthur, who described them in the *Canadian Mining Journal* on May 5th, 1922. At that time Mr. Cross suspected the occurrence in the ore of metals of the platinum group, having obtained reactions in qualitative tests that clearly indicated their pressure. However, he was unable to obtain official confirmation of the fact. Since that time analyses made by the Mines Branch, Ottawa, have determined in fair samples of the ore, platinum from 0.2 to 0.4 ounces per ton, and palladium from 0.08 to 0.12 ounces per ton. The samples contained from 0.04 to 5.95 per cent nickel and a relatively large amount of insoluble material. These results indicate that there is a relatively high content of platinum group metals in the deposits and that, as far as known, these occur almost uniformly in the wider ore bodies along the whole length of the deposits, a mile in extent.

The deposits, as described by Dr. Tanton, are a type of replacement deposit in Keewatin schists and associated acidic dykes, parallel to a huge granitic batholith and at a distance of 50 to 150 feet away from it. Part of the schist is an altered peridotite, and it is in this peridotite that the lenses, filaments and irregular masses of sulphide minerals occur. The deposits have been uncovered in trenches in the rock, so that widths rather than lengths have been determined. The largest body so far opened up has a width of 19 feet. As the sulphide-bearing rock has been deeply weathered, it has been difficult to outline the deposits.

Regarding the origin of the deposits, Dr. Tanton found evidence that it is magmatic, and that the mineral-bearing material was derived from an intrusion later in age than the granite batholith.

New Survey From Kitsault River to Skeena River

Dr. George Hanson's Reconnaissance of 95-mile Strip along Coast Range Batholith

In pursuance of its stated policy to aid and direct the prospector, the Geological Survey maps each year promising mineral-bearing areas. In British Columbia last year George Hanson made a reconnaissance of a 95-mile stretch along the east flank of the Coast Range batholith. An interim report is published in **Summary Report, 1922, Part A,** from which the following paragraphs, of economic interest, are abstracted:

During the field season of 1922 the writer carried on a geological reconnaissance in the area between Kitsault river and Skeena river. The area reconnoitred embraces the Alice Arm district and extends south-southeast, as a narrow belt which crosses Nass river at Aiyansh. From this point, it lies in the drainage basins of Tseax and Kitsumgallum rivers and eventually reaches Skeena river at Terrace. The possibility of the discovery of petroleum in commercial quantities in Kitsumgullum valley was to be investigated, and a general idea of the economic geology of the whole area was to be obtained. Although the contemplated reconnaissance was not finished, some information was obtained and is enbodied in the present report.

General Geology

The rocks in the area are in the main of Jurassic age. They have been severely folded in most places and intruded by granitic rocks of the Coast Range batholith, which now forms the western border of the area. The region to the north, east, and south, immediately adjoining the area, has not been explored geologically. The Jurassic formations are overlain by Cretaceous sedimentary rocks which have been intruded by granitic dykes and stocks. Unconformably above the Cretaceous lie isolated patches of Tertiary sedimentary rocks and lava flows. Pleistocene glacial debris is found locally; recent gravels and clays are found along the main valleys; and a recent lava flow perhaps 300 years old is present in the central part of the area.

The area under discussion lies along the eastern border of the Coast Range batholith. It is 95 miles long, and, naturally, contains several types of mineral deposits. Most of those in upper Kitsault valley have been described recently, and will not be again described here. The mineral deposits could be divided into groups on a basis of form or mineral content, but it is more convenient here to describe the few that were examined according to the locality in which they occur. All of them were formed by ascending mineral-bearing solutions emanating from some underlying source—probably the Coast Range batholith and associated outlying stocks. In a few instances the primary mineral deposits thus formed have been modified by supercial agencies. In addition to metallic mineral deposits, coal seams occur in the area.

Alice Arm District

This district has undoubted economic possibilities. The mining of high-grade silver ore appeals to the prospector, because ore can be mined with practically no outlay of capital. A prospector cannot, however, afford to build wagon roads, or even pack trails, for the purpose of taking out his ore; consequently, wagon roads through the more promising mining districts would be of very great aid.

Mining might also be carried out on a moderately large scale, and lower grades might be used, if the ore were concentrated instead of being shipped direct. This might be done by a company controlling several properties within easy reach of the mill. There are a few properties with good surface showings and others where hopes of discovering good ore seem well founded. A few of these properties may develop into mines.

Excepting the properties in the upper Kitsault valley described last year, only two properties in the Alice Arm district have shipped ore. These are the Esperanza and the La Rose. The La Rose has made two shipments amounting to 33 tons, carrying 0.12 ounces gold and 235 ounces of silver per ton. The Esperanza has made small shipments for a number of years, the ore containing up to 0.2 ounces gold and about 200 ounces silver per ton.

Properties on Northeast Fork of Kitsault and Illiance Rivers

On the northeast fork of Kitsault river the San Diego and Red Bluff properties lie in a fine-grained grey rock apparently of sedimentary origin, but similar in many ways to the "copper belt" rocks farther north. The properties farther upstream lie in sedimentary rocks that are chiefly argillites of the Jurassic sedimentary series.

On upper Illiance river the tuffaceous sediments and tuffs have a north to north-northwest strike. On the east and also on the west side of the river the rocks dip gently to the west, but in a zone which is followed by the stream they dip steeply to the west. There appears to be a sharp flexure in the formation, the west side having moved downward in relation to the east side. Along the flexure the rocks are sheared and along this sheared zone ore solutions have ascended and formed a number of mineral deposits. The Bellevue, United Metals, Silver Bell, and half a dozen other mineral properties, have been staked along this zone. The mineral zone is strongly defined and may contain rich and perhaps extensive shoots of ore. The mineralization is of the silver-lead type. The Monarch is one of the few properties which have been staked on Illiance river outside this main size. It is located at the headwaters of the river in a country rock of tuff. The mineral deposit is a quartz vein containing silver-bearing grey copper. The vein strikes north and dips west. Two blocks of the vein offset by a cross-fault are exposed, and to trace the vein an obtain a better idea where it will be encountered at depth, surface work should be done.

A number of mineral claims have been staked in the area between the northeast fork at Kitsault and Illiance rivers, but this locality was not visited.

Properties on Lime and Roundy Creeks

The Cariboo is one of the groups of mineral claims in the region southeast of Alice Arm. The country rock is argillite and sandstone intruded by numerous sills and dykes of granitic material. The whole is extensively weathered. Molybdenite is present over a zone several hundred feet wide, but no commercial body has been exposed. Assays show white gold and silver values, and these metals are probably contained in pyrite, galena, and other minerals, disseminated through the rocks and quartz veins. It is interesting to note that immediately northeast of the property, lavas cover the older rocks. If the lava flows are of pre-Pleistocene age it is likely that products of Tertiary weathering such as secondary mineral deposits will not have been scoured off by Pleistocene glaciers in the area immediately surrounding the lava flows.

Nass-Skeena District

A different type of mineral deposit is found in this district. Some of the properties are of the silver-lead type, but the majority are gold deposits. Coal also is found in this part of the area. Only a few of the mineral claims were visited and none of those west of Tseax-Kitsumgallum valley was seen. The metallic mineral deposits here are chiefly narrow quartz veins where mining in a small way may be possible. There may be, also, large low-grade mineral deposits, but unfortunately, development has not proved the existence of any of this type. The future of coal mining in the district remains in doubt, and no workable tonnage has been proved. Drilling for oil will evidently not prove to be a successful venture.

Placer Gold—Douglas creek was worked in the early years of placer mining in British Columbia, and the creek still yields wages to a few men. The quantity of gold now taken out is not great, but gravel benches on the lower reaches of the creek and on the shores of Kitsumgallum lake near the mouth of the creek, might be tested to ascertain whether the gravels could be worked profitably on a large scale.

Coal. — Coal seams on the banks of Cedar river were described in 1914. The seams outcrop on the steep banks of the river, but are in many cases covered by small landslides. Some of the coaly material was obtained, but only from the weathered parts of the seams, and this material was chiefly graphite. Similar material was obtained from poorly exposed seams on Little Cedar river. If the material obtained can be used as evidence at all it tends to show that any coal found will be anthracite and will probably contain a good deal of graphite and schungite.

Petroleum. — One of the principal purposes of the writer's visit to the Kitsumgallum valley was to inquire into the possibility of finding petroleum in commercial quantities. No evidence was found to indicate the presence or former presence of petroleum in the valley. The sericite schists, Jurassic volcanic and sedimentary rocks, and the granitic rocks of the Coast Range batholith, need not be considered as probable containers of commercial petroleum. The shaly argillites of probable Cretaceous age remain. These rocks have been intruded by dykes and small stocks, and in some places art faulted and steeply folded. Marine fossils are scarce if they are present at all. No seepages and no residues from the former escape of oil were found. The absence of any evidence favouring the presence of petroleum, and the unfavourable geological evidence combine to discourage search for petroleum in the valley.

Kispiox valley. — A few days were spent in the Kispiox valley to investigate the probability of petroleum in commercial quantities. Although the time spent was brief it was sufficiently long to convince the writer that there is a dearth of any favourable indications.

No evidence was found to indicate that petroleum existed in the rocks. Until positive indications of the presence of petroleum are discovered, the idea of drilling for oil should not be entertained.

THE GOLD DEPOSITS AT MAKWA, ONTARIO

In September of last year T. L. Tanton examined a gold find one-half mile east of Makwa station on the Canadian National Railway, 77 miles northwest of Capreol, Ontario. A brief report is contained in *Summary Report*, 1922, *Part D.* of the Geological Survey. Between Makwa and Gogama, nine miles to the north there is a band of Keewatin schists about two miles wide, with granite on both sides. There is no definite boundary between the schists and the granite, and it is an "island" of this transitional rock that the gold occurs. There are numerous quartz veins, but these carry only low gold values. Spectacularly rich ore is found with limonite in joint planes in the rock. In places the joint planes and limonite are so abundant as to give the appearance of gossan. One sample of this material assayed $160 to the ton.

Dr. Tanton suggests that this gold has been derived by weathering from rock that formerly covered the present surface. The auriferous limonite is, then, the bottom three feet of a rich secondary deposit, the larger part of which was swept away in Glacial times.

In conclusion the report states "that the quartz veins are genetically related to the granite intrusion and that the rich secondary gold deposit has resulted from the weathering of a primary deposit during past geological ages. The surface examination indicates that no commercial deposit of gold ore has yet been encountered on the claims. It is possible, however, that further prospecting will reveal either larger bodies of secondary gold ore or richer primary deposits than are now known."

ALGOMA STEEL'S ANNUAL REPORT

The report of the Lake Superior Corporation recently issued contains the annual statement of the Algoma Steel Corporation, Limited, one of their susbsidiary companies, for the year ended June 30. In this company conditions were much the same as in the previous year. The rail mill was closed down from September 1 to February 19 and since resumption has operated at capacity. The 18" mill was closed down for more than half the year on account of lack of orders and for the greater part of the remainder of the time was on single turn. The 12" mill operated for about three months on single turn and for the remainder of the period was closed.

Net earnings of the Algoma Steel Corporation totalled $355,092 to which was added $112,500, dividends from subsidiary companies, making a total of $467,592. Disbursements on account of interest totalled $1,049,232, leaving a loss for the year of $581,639. Including a debit balance forward of $171,812 and United States income tax of $1,880 there is a balance at debit of $755,332. Current assets increased during the year from $6,990,872 to $8,254,241 and current liabilities from $1,930,675 to $3,818,749.

The Collieries of British Columbia

VI — Middleboro, Fleming, Princeton, and Chu Chua Collieries

By ROBERT DUNN

Middlesboro Collieries

The Middlesboro Collieries Ltd. is another enterprise being financed from Vancouver. It is capitalized at $1,107,700 and its officers are E. W. Hamber, president; G. S. Raphael, vice-president; Thomas Sanderson, managing director and secretary; C. M. O'Brian, treasurer, and Robert Fairfoul, mine manager. The mine and plant are one and a half miles west of Merritt. The mine is being worked on the coal measures of the northwest portion of the Nicola basin, on the west side of Coldwater River. Here the foothills rise to a height of about 700 feet and contain a number of good, workable seams of coal about six feet in thickness, having an average pitch of 30 degrees towards the south.

The No. 4 Mine is the largest and most important on this property. It consists of a horizontal tunnel driven from the foot of the hill on the same elevation as the tipple, following No. 5 seam of coal for a short distance. From this crosscut drifts are driven through the rock to Nos. 6 and 8 seams. Practically all the tunnelling on the main level is in sandstone rock a little below the footwall of the seams. Raises are driven to the seams, with the result that there is no trouble in maintaining good haulage roads when the pillars are extracted above this road.

Headings are driven from the main level following the full pitch of the seams to the surface croppings. where openings are made to facilitate the handling of timber and the ventilation of the mine. Dump-car roads or levels about 8 feet wide are driven from these headings, spaced 60 feet and following the strike of the seam. They are connected by crosscuts for ventilation purposes. Pillar drawing is commenced in the levels nearest the croppings and drawn back to the level on the retreating system, the headings being kept open as long as possible by cogs built on each side of the road.

The coal is loaded into small dump-cars at the various faces and trammed by hand to the headings, where it is dumped into the chute and conveyed to the main No. 4 level, loaded into the mine cars as required, collected by mule haulage and taken to the surface in trips by main and tail rope haulage.

No. 7 and No. 4 East Mines

No. 7 Mine is on the same seam of coal as No. 3 at the Fleming Colliery. The seam is about 16 feet thick and lies below the seams that are being operated from No. 4 mine. It was opened up from the croppings at the top of the hill by a pair of slopes following the full pitch of the seam and is mined by the pillar and stall method. The top 10 feet of the seam only is being extracted. Work in this mine at present, is confined to the drawing of pillars from the No. 4 levels to the croppings, so that the life of the mine is somewhat limited. The coal is hoisted by main rope haulage to the surface and lowered over a surface incline to the tipple.

No. 4 East Mine is a slope 1,200 feet to the east of the tripple, and is operating in No. 1 seam. The measures here are found to be subject to a great deal of faulting, causing mining to be restricted to the driving of the main heading and counter. All present work consists in the extraction of pillars in close proximity to the headings near No. 5 level. This is the only mine that is working to the dip below the level of the tipple. It shows the field to be subject to a great deal of faulting with depth. The mine cars are collected at the faces by horse haulage, are taken to a landing near the slope and from there hauled to the surface by main rope haulage.

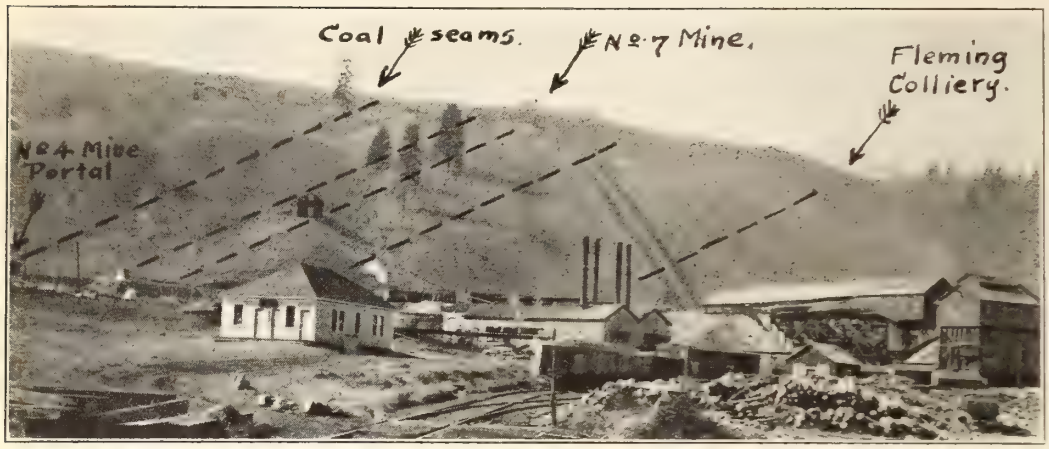
No. 4 East prospect is in a small area of coal near the outcrop of the 4 East mine. An entrance was made from the surface, connecting with the coal at a distance of 80 feet. The method of mining is pillar and stall.

As to plant and equipment, the coal is conveyed from the face to the mine-cars by chutes, and then hauled to the tipple by means of compressed air hoists and ropes. Ventilation is produced by a Sheldon fan 8.5 feet in diameter, direct connected to an Ideal steam engine, 14 by 18 inches, and is so arranged that the direction of the current can be changed. The main power plant is near the tipple, consisting of four return-tubular boilers, each 160 H.P.; Canadian cross-compound compressor with a capacity of 2,000 cubic feet of free air a minute; Ideal compound engine direct-connected to 75 K.W. 2,300-volt General Electric generator; and a 25 K. W. direct-current steam-engine set for lighting purposes.

Fleming Colliery

Another colliery that has been directed from Vancouver is the Fleming Coal Co. Ltd., at the head of which for years was Mr. Joseph Martin, who died some months ago and whose name will long be remembered as one of those prominently associated with the early political history of Canada. Mr. Martin had the utmost confidence in the potentialities of the coal industry of the Nicola district. The Company's operations of late have been in the southwest portion of the Nicola field, the mine being about 1½ miles from Merritt. Other officers are Joseph Graham, managing director and A. E. Smith, manager.

Work ceased last February owing to exhaustion of No. 2 Mine. This was on a seam of an average thickness of 6 feet which was developed by the pillar and stall method under favorable conditions. Owing to the pitch of the seam, the coal was conveyed from the various faces by means of chutes to the main levels where it was loaded into mine cars. Considerable prospecting has been done with a view to the opening up of the measures on other parts of the property. A nine-foot seam was uncovered but, as it was not conveniently located, a rock tunnel was driven at the foot of a hill and, when driven some 500 feet, a six-foot seam was cut and was developed to some extent by levels in the seam. The tunnel was continued about 70 feet and a bore-hole was run into the roof, proving a seam of coal about 25 feet above. As stated above, however, all operations have come to



Middlesboro Colliery, showing the location, of coal seams in the hillside, the incline from No. 7 Mine, the tripple and the power plant.

an end for present, no doubt owing to the unsatisfactory condition of the market.

The plant consists of two Leonard-return-tubular boilers with a joint capacity of 80 horse-power, which provide power for the main haulage, fan-engine and lighting plant, and heat for the wash and change house; a 25-horse-power vertical boiler near the tipple, which provides power for a small hoist and for a pump to elevate water from a storage-tank at the tipple to a tank at the mine; while a small pumping plant is situated at the river, delivering water to the storage-tank at the tipple.

The surface equipment consists of machine, carpenter, and car-repairing shops, office buildings, and wash and change rooms at the mine.

Princeton Coal & Land Co.

The Princeton Coal & Land Company Ltd. which is on the bank of the Similkameen River near the town of Princeton, is capitalized at $1,000,000 and its directors include A. St. George Hamersley, Chairman, and E. S. Neave, secretary, of London, England. Ernest Waterman is the general manager and Francis Glover the manager, both the latter being resident at Princeton. The measures are reached by two 12 per cent. slopes driven on the dip of the seam, which, where cut 200 feet from the portal of the main slope has an average thickness of 20 feet. It is being exploited by the pillar and stall system, work being restricted usually to the upper ten feet of the seam. Of late the coal has been taken from the pillars and a small section lying to the west of the slopes. The workable area is small and of late operations here have been confined to the drawing of pillars in close proximity to the main slope. Little blasting is required. Ventilation is provided for by a single inlet, belt-driven fan of the Guibal type, placed near the entrance to the counter slope.

New Entry in Good Coal Seam

The management of the Princeton Coal and Land Co., have been successful in driving a 12 per cent. 8 x 10 haulage slope from the surface through 120 feet of sand and gravel. This connected the new prospect on the east side of the old No. 2 mine, where a 7-feet seam of coal overlaid by hard sandstone has been proved. Workmen are at present engaged in erecting the necessary equipment, track and sidings for connecting this new entry with the No. 1 Mine tipple, which is 1,500 feet southeast of the new opening. This will open up and develop a large area of virgin coal land, where the structure and quality of the coal is expected to show a marked improvement.

The coal produced in this colliery may be considered as a high-grade lignite and when cleaned it is considered a good domestic fuel. A large portion of the production finds a ready market in the coast cities. Practically all the coal produced is machine mined, very little blasting being required, the object being to produce as large a proportion of lump as possible. The surface equipment consists of a wooden tipple provided with a rotary dump, by which the mine-cars are emptied upon a stationary 2-inch bar-screen, from which the large coal is cleaned and loaded into the railway-cars, the small coal falling upon a small hanging shaking screen of ¾ inch mesh, whence the large portion of the screenings is collected by a belt-conveyor, dumping into a chute.

The power plant consists of three return-tubular boilers with an aggregate capacity of 200 H.P., supplying power for a Canadian Rand air-compressor with a capacity of 750 cubic feet of free air a minute, used for running the hoists, mining machines, and pumps in the mine. A 25 horse-power steam hoist near the tipple is used for hoisting the mine-cars from No. 1 mine.

A well equipped machine-shop, car repairing and carpenter's shop, with wash and change room and lamp-room, are maintained, while a 30,000-gallon water-tank provides for the storage of water for use at the plant and also for fire-protection purposes.

Chu Chua Coal Co.

American capital, mainly from the State of Washington, is behind the enterprise at Chu Chua known as the Chu Chua Coal Co. Ltd. The directors are A. H. B. Jordan, president; W. H. Glass, vice-president; Q. A. Thomas, general manager, Major H. S. Hodgson, secretary-treasurer; and David Brown, manager. All, with the exception of the manager, have their headquarters either at Everett or Seattle, Wn. The property, the development of which was commenced only recently, is 55 miles north of Kamloops on the north side of the Thompson river and comprises part of the foothills and flats on each side of Coal Creek.

There are several outcrops of coal, the chief of which are the "Thomas," "Smith" and "Gray" seams. Until the year 1921 all the development work had been done on the upper Thomas seam. This is about 3 feet in thickness, including bands of rock

The coal is of a good quality and commands a ready market in Kamloops.

This coal seam is being developed by the longwall system. As it is overlaid with a sandstone roof dipping into the hill at an angle of 12 degrees, mining conditions are favourable. With depth the seam was found to become thinner, while the rock bands were more pronounced and, as a result, operations were closed at this mine during February of the present year.

During 1921 the "Gray", or lowest seam to be seen on this property, was uncovered by removing the glacial drift in the Creek. A thirty-degree slope was commenced at the surface at the foot of the hill and encountered the seam at a distance of 80 feet, when it was opened up by the pillar and stall method. This seam was found to be of poor quality and as a result work was discontinued.

All development work thus far has been on an upper series of the measures where the coal is found exposed at the side of the creek. Below the "Gray" seam the surface flattens considerably and the measures have a heavy covering of glacial drift and river silt.

John Hutchinson, mining engineer of Everett, Washington, inspected the property last January and strongly advocated that the company drill below the "Gray" seam.

Portable Electric Drills In Mines

By W. E. BALLARD*

Ever since the mining of coal on his continent assumed the proportions of an industry, it has been almost the universal practice to permit the miner to bore his own shot holes. It may be said with equal truth that the same practice is followed in charging and firing shot holes. To the layman the handling of explosive appears to be a somewhat dangerous proceeding, and he is surprised that there has been so little change in general practice since the commencement of the industry. He is forced to admit that, although we pride ourselves on the rapid strides we have made in the past few decades in transportation, communication, manufacturing and many other lines of industry, after all in a great many lines of endeavor we are but the slaves of tradition and simply continue to do things as our ancestors did.

However, there are some coal mining companies that have recognized the possibility of increasing their production by boring the shot holes for the miners by power; and they have likewise reduced the danger of mining by having the holes charged and fired by a man who has been specially trained in this work.

Electricity is the preferred power for use in drilling shot holes, as it is usually present in the mines already for the use of modern machinery, such as cutters, locomotives, loaders and pumps. When the coal mine operator first thought of using power instead of manual labor to bore holes he naturally looked for a machine to bore his harder materials, and this lead to the devel

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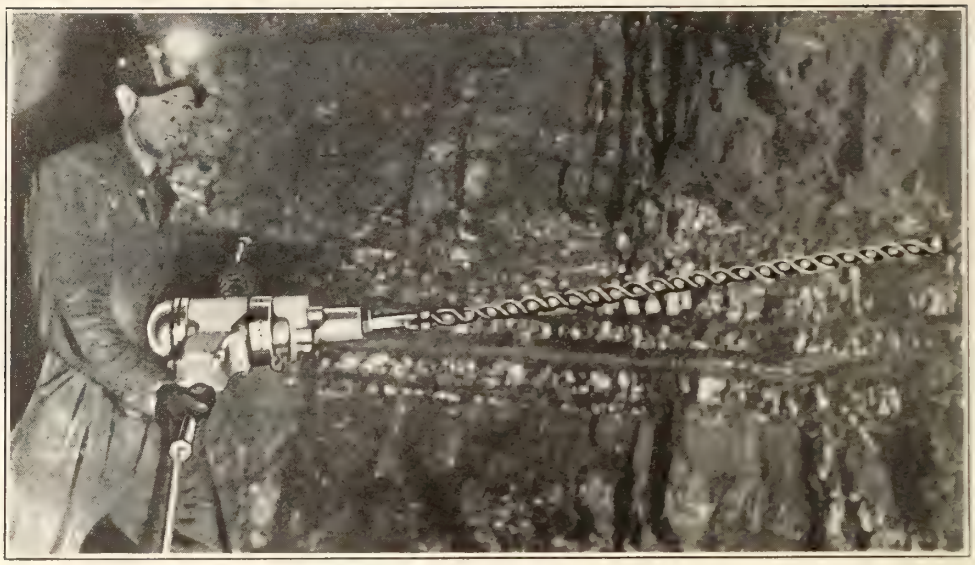
Portable Electric Drill mounted on a light column to drill coal of soft rock



Portable Electric Drill in a Coal Mine

opment of an admirable tool for the work. It has sufficient weight to enable it to hold the cutting auger or drill up against the material to be cut, and is mounted on wheels that fit the mine tracks and permit it to be moved around from place to place by the mine locomotives.

A little later the progressive operator wanted a lighter tool to bore his softer materials, and this led to the application of the light portable electric drill to the job. Such a tool weighs from 25 to 35 pounds. This tool bores shot holes in soft coal in a surprisingly short time, and can be operated by one man, as well as carried from place to place, together with the necessary augers. The builders of portable electric drills have been enabled to keep the weight down, without sacrificing power or strength, by the use of a special aluminum alloy in the manufacture of the field and gear cases and commutator cover.

The next step was to use a more powerful drill in the harder coal. For such work a tool has been developed which, although it is fitted with a motor conservatively rated at 1¼ horsepower and has a gear reduction of 35:1 between the motor shaft and the auger spindle, has a weight of but 55 pounds. This is a two-man tool, not because of its weight, but because of the power it develops. The writer has seen this drill used as a one-man tool but considers such practice undesirable, as the torque developed when the auger hits a hard substance such as a sulphur pocket is more than one man can resist, and he is apt to be injured before he releases the automatic switch that cuts off the power.

In working comparatively thin seams of coal, it is advantageous to use the lighter tools in boring shot holes in slate or sandstone when it is necessary to take down the roof or take up some of the floor. For such work the two men operating the drill have not the physical strength to force the cutting edge into the material, and it becomes necessary to use a hand-operated post drilling machine fitted with a feed bar. The electric drill, of course, is substituted for the hand power. Such a combination is inexpensive and is light enough to be moved around by two men. In many instances the restriction imposed by lack of space make it impossible to use a long feed bar, and although it is necessary to use three augers, two, four and six feet in length, in drilling a six-foot hole 1¾ inches in diameter, two men can easily drill two such holes in a place in 20 minutes. The actual boring is done at a rate of about two feet per minute.

While a great many operators continue to use 1¾-inch augers in boring their shot holes, some have recognized the advantage of boring a hole 1 inch in diameter. The smaller hole requires approximately one-half the energy required to drive the larger hole the same distance.

There is no doubt that in a few years, as the knowledge of the more modern methods of mining spreads among the coal mine operators, the boring of shot holes by the miner will become a thing of the past. With the passing of that practice will also come the charging and firing of shot holes by the "company", and one more hazard of the mine will be removed.

BRICKS FROM MINE DUMPS

It is believed that at last the mine dumps of the Rand will be turned to commercial use by the manufacture of bricks. It appears that some time ago Mr. W. Ingham, chief engineer to the Rand Water Board, caused to be sent oversea, for testing in the new plant that has produced lime-sand brick for actual buildings, hermetically sealed samples of sand from the dumps of the George Goch, Ferreira and Robinson Deep Mines, together with quantities of white and blue lime from the Nothern Lime Co. and the Ventersdorp Co. The sands were first freed from all trace of cyanide. Mr. W. Arnott, engineer, of Glasgow, took these samples of sand and lime to the Continent and there personally inspected the process. As a result, samples of bricks have reached Johannesburg, and it is claimed that they fill all the purposes of faced bricks at a low cost. They are hard, and grey-white in colour. They have been inspected with great interest, and a company has been formed. It is stated that 56,000 of these bricks can be turned out per day at a cost of 27s. 6d. per thousand. In his report Mr. Arnott says the bricks "are better than the best clay bricks, and are justly known as hard bricks. A crushing resistance of over 4,000 lbs. per square inch has been obtained, and a degree of hardness far surpassing clinker bricks." — "South African Engineering and Mining Journal."

THE MINING DISTRICTS

By THE JOURNAL'S CORRESPONDENTS

NORTHERN ONTARIO

Interim Report by Mining Corporation.—The Mining Corporation has issued an interim report on its properties in South Lorrain. The report states the company now holds approximately 500 acres, of which only a comparatively small proportion has been developed. The undeveloped portion has the same favorable geological features as the part which has already given such a substantial production, and it is estimated that several years will be required to explore this northern part. To date the ounces of high grade ore produced by hand picking amounts to about 1,500,000. In addition to this 120 tons of low silver, high cobalt ore has been produced and marketed for its cobalt content. There is also available on the dump 8,000 tons of mill ore, estimated to contain 250,000 ounces. This large production has come from development work and from limited stoping operations, the greatest production being from a stope 100 feet long, 80 feet high and 6 feet wide. A number of promising showings on veins which produced silver have not yet been developed. Development and exploration work has been retarded by the limited shaft capacity. A new shaft, however, has been sunk to a depth of 550 feet and will be in operation in October, when underground work will be out on a much more extensive scale. The report gives details as to the work done and contemplated on different veins and states that exploration work has just reached the point where past experience justifies the hope of very important developments. The holdings of the company have, as yet, been merely scratched, and it will take years of work to explore the properties' possibilities.

To Enlarge Schumacher Shaft.—The Hollinger proposes to enlarge its Schumacher shaft so that it will be 15 feet square in the clear. Work of enlargement will be carried on simultaneously from the surface and from the 800 foot level, and when completed it will be continued to greater depth. The company is installing a large amount of new machinery for both the mill and the mine. The crushing plant now has a capacity of 8,000 tons a day and three new rod mills of 800 tons a day capacity each are being installed and replacing stamps. New tanks are being erected and the capacity of the mill will gradually be enlarged. Although all these plans are being carried out with a view to treating 8,000 tons a day, the management states that it does not contemplate any immediate increase above the tonnage of 4,500 tons a day now being treated, giving as an excuse that this will not be done until there is a continuous supply of ample power to permit of operating at this capacity steadily. The management intimates that another power shortage is expected this winter, but the power officials state that they do not expect one and that they are in a position to contract for approximately 5,000 additional h. p.

Dome's August Production.—During the month of August the production from the Dome amounted to $431,019. This compares with $435,547 in July and with $352,774 in August 1922.

Mill on Nighthawk Peninsula.—Good progress is being made with the construction of the 200 ton mill on the Nighthawk Peninsula. Most of the machinery is on the ground and some of it has been erected. Tanks are now being built and the mill building is now completed. If the present rate of progress is maintained, it is expected that the mill will be in operation some time in November.

MacEnaney Mine Closes Down.—The MacEnaney Mine, formerly known as the Hollinger Reserve, has been closed down. It is understood, however, that the company anticipate doing further exploration work by means of diamond drilling. In the same vicinity the Hayden shaft has reached a depth of 720 feet, and sinking will be continued to the 1,000 foot level. Work has been stopped on the Moneta property, adjoining the Hollinger, on which operations have been financed by the Kirkland Lake Proprietary. It is understood, however, that the Proprietary has not taken up the second block of treasury shares, and presumably does not propose to continue further exploration work.

Vipond Annual Meeting.—The annual meeting of the Vipond has been called for September 20th. The notice calling the meeting is accompanied by a financial statement showing that there is approximately $215,000 in the treasury. Underground developments continue to be favorable and the mill should be started this fall.

Kirkland Lake.—The Bidgood Mines in Kirkland Lake, on which approximately $300,000 has been spent to date, is in need of further funds, and in order to provide the necessary money a Toronto syndicate, headed by Homer L. Gibson, has agreed to take an option on the unissued treasury stock, provided all the stock holders will pool their stock for a period of nine months, subject to an option by the syndicate to purchase one half of the shareholders' stock at a price of 25 cents a share. The President has written a letter to the shareholders stating that he believes the proposition to be a fair one and advising them to deposit their shares with the Trust company. Development to date has been confined almost entirely to No. 9 vein, on which commercial ore shoots have been found on the 300 and 400 foot levels, but the ore has not been in sufficient quantities to justify preparations for milling.

It is stated that an amalgamation of the Tough Oakes and Burnside, with three other claims in the Kirkland area, will shortly be announced. Development work is being carried on at the 800 foot level of the Tough Oakes, and satisfactory results have been met with.

Blue Diamond Coal Mine.—For the year ending June 30th, 1923, the annual report of the Blue Diamond Coal Mine, which is owned jointly by the McIntyre and Temiskaming Mines, shows operating profits of $157,343, a decrease of $9,000 compared with the previous year. After deducting interest amounting to $48,135 and Taxes, Royalties and Rentals of $68,486 there remained a net profit of $40,732, a decrease of $15,000 as compared with 1922. The balance sheet

shows advances of $580,000 from the holding company and a surplus of $65,753.

Larder Lake.—On the 550 foot level of the Crown Reserve property in Larder Lake, 270 feet of drifting has been done on the No. 1 vein, which shows a width of from 14 to 41 feet. 200 feet of drifting has been done on No. 2 vein, and assay results on both of these ore bodies are stated to be satisfactory.

Syndicate Negotiating.—It is reported that a syndicate is negotiating for 1,000,000 shares of Baldwin stock in order to provide sufficient money to carry on further development work. The Barrey-Hollinger, which is the old Patricia Mine, will sink from the 200 to the 500 foot level, and will open levels at 350 and 500 feet. The vein is about 8 inches wide and carried good values in places.

Option Dropped.—The Tonopah Mining Company has dropped its option on the Moffat Hall property, and John Taylor & Sons of London, have dropped their option on the Kitchener Kirkland.

NOVA SCOTIA

New Waterford District—Preparations for sinking another large shaft in the New Waterford District have begun. A railway spur is being laid from the main line into the location of this colliery, and when it is completed material will be taken in by rail and the work of sinking will then begin. Like all other shafts lately put down, it will be sunk as close to the coast line as safety and practice will permit. The shaft will tap the Phalen Seam, and the most of the workings will be under the sea. The coal is known to be of good quality, as the upper part of the workings of the old Lingan Colliery, which is in close proximity was about eight feet thick. This colliery was worked for a number of years, and closed down about forty years ago. The shaft will not be very deep at the point of location, and as the strata is well known the cost of sinking should not be very large. However, nearly every colliery put down at the present time, requires a very large expenditure before the surface equipment is complete, and the mine ready for a large output.

The site for a colliery village is an ideal one, the exposure being towards the south, the land lying along the Lingan Harbour, and quite close to the old shipping piers. Without doubt, it will make one of the most beautiful colliery villages in the Island, as there is a gradual slope towards the shore, which will favor drainage, when the houses are built. The location is also central and lies between the collieries in the Glace Bay District and that of Waterford. Nothing but shaft sinking may be done this winter, but even that is going a long way in preparing for a new mine.

Much Idle Time—The collieries are having considerable idle time, due to the want of shipping and there is a feeling that strike conditions during the summer has had to do with this matter. At that time it was given out that large orders held by the coal Company were cancelled, and coal was sought for elsewhere. It now looks as if there was considerable truth in this statement, and men are beginning to fear that an inactive winter is before them. It is too early yet to state what winter conditions will be, but from what we know now, it is likely that there will be considerable work.

Some Mines at Wabana Close Down—Some of the ore mines of Wabana have closed down and quite a number of the men are out of employment. As long as it was possible the mines were kept in operation. Much work was done last winter, however, which could have been left off until the summer, but was undertaken because it would give employment to many men. Had there been prosperity in the iron trade, the mines would have operated until the end of the season, but as it is there are sufficient of them left operating to more than supply the demand.

Rescue Breathing Apparatus Corps—Miners of the Stellarton and Westville District had a very good illustration of the work of the Rescue Breathing Apparatus Corps of the Acadia Collieries on Labor Day. These corps are said to be the more efficient and best equipped in the Province of Nova Scotia and have done excellent work in times of mine fires and other mine troubles. Indeed the Stellarton Corps was on one occasion asked to go up to Halifax, and help them put a fire out, which had occurred in one of the vessels. Although the fire had been raging for a considerable time, they were successful in putting it out.

A number of new corps are being formed at the Cape Breton collieries, and will be equipped with the latest and best type of Self-Contained Breathing Apparatus. The Dominion Coal Company have taken a long time to select the type most suitable to the district, but have reached the stage when the choice lies between two. A meeting will be held next week to decide which of the two will be selected. As stated before in the "Canadian Mining Journal" it is the intention to give as much public information as possible upon the result of the test of the four different machines—the Proto, Meeca, the Gibbs, and Paul

BRITISH COLUMBIA

Rossland—With regard to the reports of the discovery and shipment of ore from the I. X. L. and Golden Drip Mines, near Rossland, carrying values so high that the railways refused to accept the risk of its transport to the Trail Smelter it is interesting to note that A. G. Langley, resident mining engineer at Revelstoke, B.C., who was quoted by newspapers as having stated that in visiting the I. X. L. he saw gold "standing out in chunks", denies making the statement and declares that he has not visited the Rossland District of the Province this Summer.

It would appear that, at least in point of Mr. Langley's comments, the reports have been exaggerated. This, however, does not discredit the properties in question. There is no doubt that rich ore has been found and Mr. Langley simply says that he has not had the opportunity this Season of confirming it in person. He went over the I. X. L. last year and refers those interested in his observations to his report published in the Annual Report of the Minister of Mines for last year.

In view of the interest recently created it is pertinent to quote Mr. Langley. He says:

The I. X. L. is "situated within 2½ miles of Rossland on the Northport road and has been worked under lease by R. B. Shelledy, J. J. Hawkins, and associates. It belongs to John S. Baker, of Tacoma. Very rich gold ore has been extracted from the upper

part of the vein since recent work was started in 1921. The ore has been shipped to the Bunker Hill and Sullivan smelter at Kellogg, Idaho. The vein is a small quartz filled fissure in serpentine. It strikes in an easterly and westerly direction and dips at about 40 degrees. The vein is exposed along the drift for about fifty feet but with the exception of a small shoot of ore is barren. The ore occurs where the vein has been faulted, which action has caused a displacement of about 3 feet. The gold bearing quartz has been fractured, which gives it a slightly banded structure. Native gold occurring as flakes along seams in the quartz is plainly visible to the naked eye. Associated minerals are siderite, iron and copper sulphides. The last shipment of about 3 tons of sorted ore is said to have yielded nearly 300 oz. in gold to the ton. The shoot from which this was mined is about 16 feet in length and about 8 inches wide. Sinking was being continued on this ore and further exploratory work was under consideration at the time of examination in June."

Cedar Creek—The original stakers on Cedar Creek, Cariboo District, British Columbia, made application recently for permission to commence action in the Supreme Court of the Province to regain possession of the claims they located and which were sold to the Cedar Creek Mining Company for $180,000 of which amount $123,000 was paid. The Company now has other difficulties and the Court refused the application giving as his reasons that a substantial proportion of the sale price had been paid, that there was a difference of opinion between litigants as to the amount due, and that the Company had not title to the property pending the decision of a number of mechanic lien actions pending against it.

Wind Pass Mine—Late reports having reference to the Wind Pass Mine, near Chu Chua, B.C., are favourable. This is another property in which W. R. Wilson, president of the Crow's Nest Pass Coal Co. and a large holder of Premier Gold Mining Co. stock, is interested. Development work is being pushed with energy, in a new and lower tunnel a substantial body of good ore has been struck and, as soon as this is proved further, it is certain that active steps will be taken to put the mine on a producing basis. The installation of the plant necessary to make the mine as self contained as possible in point of the treatment of the mineral is being considered. The importance of this to the district tributary to Kamloops, B.C., is evident and it appears that the optimism of the resident engineer for the district, Major A. W. Davis, with regard to the mining possibilities of this part of the central section of the Province, is likely to have early practical justification. In a recent statement Major Davis, while speaking of the Wind Pass in favorable terms, deprecated the tendency to exaggerate present proven prospects in the Whitewater District, which lies in the mountainous region back of the town of Lillooet. He thinks some of the press reports would stand toning down although the country is a good one for prospectors and what may develop into important discoveries have been made. This area, he points out, is adjacent to the coast batholith where everywhere in this province important producing areas have been developed. It is his intention to visit the Whitewater country again this season before the snow flies.

Slocan Mining District.—In the Slocan Mining District of British Columbia there is general activity, many properties being worked on a small scale by leasers. The R. E. Lee, a property worked for several years, has produced 14 tons which is ready for shipment; the Washington Mine, which has been under constant development for months, recently shipped 40 tons, and the Ruth Mine, which has been bonded to Vancouver interests, is looking good enough to draw favourable comment from R. H. Stewart, mining engineer, who has been inspecting a number of prospects in that locality. Regular shipments are being made from the Wonderful Mine to the Clarence Cunningham Mill at Alamo and Mr. Cunningham also has started work on the Van Roi Mine at Silverton. Leasers are said to have found ore in the Rambler-Cariboo and the Queen Bess. The Silversmith is working three shifts in mine and mill with gratifying results to shareholders.

Greenwood.—The excitement caused by late developments on the Combination Mine, Eholt Mining Co., near Greenwood, B.C., is warranted if current reports are authentic. It is said that the new ore recently struck runs $250 to the ton. Assay returns reported from samples taken by P. B. Freeland, government mining engineer, are 2.6 ounces gold and 303 ounces silver to the ton together with 13 per cent. lead and 12 per cent zinc. The high grade is 9 to 12 inches wide and lies in a vein 2 feet wide. It was struck by crosscut at a depth of 175 feet vertically and at a point 222 feet from the portal of the tunnel. The ore has been followed by a drift for from 10 to 12 feet. The Combination adjoins the Providence from which ore to the value of about one and a half million dollars has been shipped and the stockholders for the most part are residents of the City of Spokane.

Maple Leaf Mines Assignment.—The Maple Leaf Mines Ltd. has assigned under the Bankruptcy Act to Denis St. Denis, of Nelson, authorized trustee. This action prevented the mine, situated in the Franklin Camp, near Grand Forks, being sold by the sheriff to satisfy a judgment creditor, H. W. Young, former managing director.

The Jubilee Mining Co., has been incorporated to take over and develop the "Spotted Horse" a Crown granted group of mineral claims situated on Jubilee Peak overlooking the town of Greenwood. Surface stripping and other work has started, the necessary plant is to be obtained, and the new company looks forward to making shipments shortly. Assays of ore taken from the exposed ledge are given as $8 gold, 104 ounces silver, and a considerable percentage of lead to the ton.

Field Meet at Ladysmith.—A Mine Rescue and First Aid Field Meet was held at Ladysmith, B.C., on Labor Day, September 3rd, under the auspices of the Vancouver Island Mine Safety Association. Teams were in attendance from the most important of the coal mining centres of the Province including Cumberland, Ladysmith, Nanaimo, Cassidy, South Wellington and Fernie. Each outside community sent a large coterie of supporters and the contests were closely and enthusiastically watched. Hon. Wm. Sloean, Minister of Mines, George Wilkinson, Chief Inspector of Mines, and Thos. Graham, who has been appointed to the position of General Manager of the Canadian Collieries (D) Ltd., in place of J. M. Savage, deceased, were present. It may be said here, as an aside, that the news of Mr. Graham's appointment has created a very

favorable impression in coal mining centres on the Island and among business men throughout the Province. The same may be said of the announcement of the elevation of Charles Graham, a brother, to the post of General Superintendent, formerly held by Thos. Graham. After the sports the prizes were presented by the Hon. Mr. Sloan.

The results of the competitions follow:

Mine Rescue Event: 1st, Capt. T. Williams' team, Cumberland, 93.2; 2nd, Capt. Coufield's team, Fernie, 93; 9rd, Capt. Broderick's team, Nanaimo, 89.4.

First Aid—B. C. Mines Cup: 1st, Capt. J. Barton's team, Nanaimo; 2nd, Capt. Beveridge's team, Cumberland.

Coulson Cup: 1st, Capt. Beveridge's team, Cumberland; 2nd, Capt. J. Delaney's team, Ladysmith.

One Man Event: 1st, J. Thompson, Nanaimo; 2nd, Mr. Hewlitt, Ladysmith.

Two Man Event: 1st, J. B. Stewart (Capt.), Cassidy; 2nd, W. Thorpe (Capt.), Nanaimo.

Jvenile Event: 1st, C. Wharton's team, Nanaimo; 2nd, Mr. Wilson's team, Ladysmith.

Ladies' Cup: 1st, Mrs. Hudson (Capt.) Cumberland; 2nd, Mrs. Delaney (Capt.), Ladysmith; 3rd, Mrs. Rutherford (Capt.), Nanaimo.

The annual mine rescue and first aid competitions of the East Kootenay Mine Safety Association were held at Michel, B.C., on Saturday the 1st September. There was an entry of seven mine rescue and ten first aid teams, two of the former and three of the latter coming from the coal fields of the Province of Alberta and the remainder representing eastern British Columbia. W. R. Wilson, president of the Crow's Nest Pass Coal Co., presented the prizes.

Following are the results:

Mine Rescue: 1st, Coal Creek, Capt. J. Caulfield; 2nd, Michel No. 2, Capt. M. Littler; 3rd, Fernie No. 1, Capt. E. Hesketh; 4th, Michel No. 1, Capt. A. Howden; 5th, Fernie No. 2, Capt. W. Hynds; 6th, Bellevue, Capt. J. J. McIntyre; 7th, Lethbridge, Capt. W. S. Crawford.

Senior First Aid: 1st, Fernie, Capt. J. Hamer; 2nd, Michel No. 1, Capt. W. Fowler; 3rd, Bellevue, Capt. J. Milnes, and Lethbridge, Capt. W. W. Short, tie; 5th, Michel No. 2, Capt. D. Izatt; 6th Coal Creek, Capt. J. Eccleston.

Ladies' First Aid: 1st, Coal Creek, Mrs Miller (Capt.); 2nd, Michel, Mrs. Mossby (Capt.).

Junior First Aid: 1st, Fernie Boys' Scouts, Capt. J. Larmont; 2nd, Hillcrest, Capt. C. Smith.

Coal Mining.—Coal mining in British Columbia has been proceeding, more or less uneventfully, during the last few weeks. On Vancouver Island conditions are about normal, both as to production and in respect of the state of mind of employer and employee. A misunderstanding as to contract rates closed down the Wakesiah Mine, Western Fuel Corporation of Canada, Nanaimo, for one day, a speedy adjustment sending the men back to their work the day following the walk-out. The appointment of Thos. Graham to the position of General Manager of the Canadian Collieries (D) Ltd. is accepted as meaning that the Company, for the present at least, is satisfied to continue the policy of the late J. M. Savage of combining exploitation of the Company's extensive island coal bearing areas to the point of present market requirements with constant exploration and development. Under the direction of Mr. Graham and his brother, Charles Graham, it is felt that the administrative and the operating branches of this important enterprise will be competently handled.

In the Nicola-Princeton Field the cessation of operations on the part of the Fleming Coal Co., following the death of the late Joseph Martin, one of its chief owners, has had its effect on the production. That, however, has been off-set to some extent by increases in the output of the Coalmont Coal Co. In this connection the recent announcement of the English Syndicate which has secured control of the Princeton Coal & Land Co., that these holdings are to be more energetically exploited and that the monthly production may be expected to jump from about 125 to 500 tons a month is encouraging.

It would not be surprising to find the Coal Creek Collieries curtailing their production as a result of the conversion of most of the Great Northern Ry. locomotives to oil burners. This, however, has not yet been apparent. Evidently the collieries of the Crow's Nest Pass have been able to find alternative markets up to the present. The Trail Smelter, Consolidated Mining & Smelting Co., of Canada, now is taking considerable quantities, a reserve supply of fuel having been almost exhausted. It is known, too that the enterprise of eastern British Columbia Collieries has been rewarded with some first class contracts on the prairies. It is possible, therefore, that the output of the mines may be maintained at the normal rate of previous years notwithstanding the serious blow that has been dealt an hitherto steady export market.

Several accidents have occurred recently in the mines of the Western Fuel Corporation of Canada, Nanaimo, B.C. J. Blades and R. Morgan, coal miners, were killed in a fall of rock which extended a distance of thirty feet back from the face. They were engaged on pillar work in a place twenty feet high when the cave took place. A fall of rock in the Wakesiah Mine of the same Corporation injured Wilson McLellan, a coal miner, who is on the way to recovery.

ALBERTA

Much Unemployment.—Reports from the western coal fields of the Province of Alberta indicate that there has been considerable unemployment during the summer. A reduction in the demands of railroads and the weakness of the domestic market are given as the reasons for this condition. It is said that 3,000 miners have been out of work in the Alberta section of District 18, U. M. W. of A. and that in other fields the mines have been running half time. The trade has been markedly slack on the Drumheller Valley, the towns of Drumheller, Wayne and Rosedale being most affected.

The relations between the operators and the miners in Alberta have been better than was anticipated. A strike was promised in the Edmonton-Clover Bar Field, chiefly because of the declaration of independence of the U. M. W. of A. by seven mines in the district. Pickets maintained at the mines since December 1st, 1922, according to report, have been withdrawn and in addressing a strike meeting at Beverly, Alberta, W. A. Shermon, president of District 18, U. M. W. of A., is quoted as admitting failure to break in on the local union.

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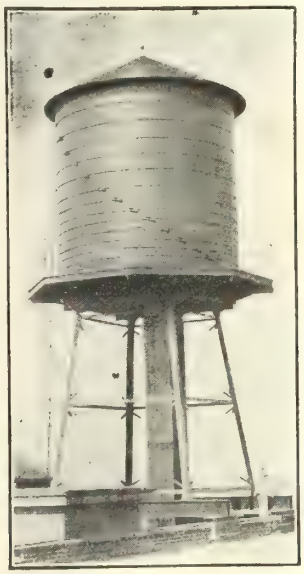

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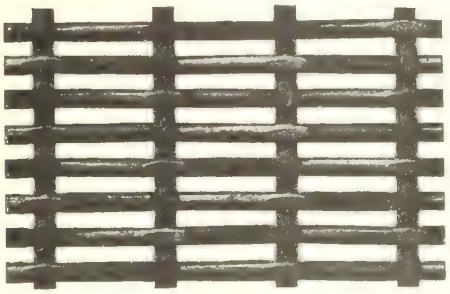

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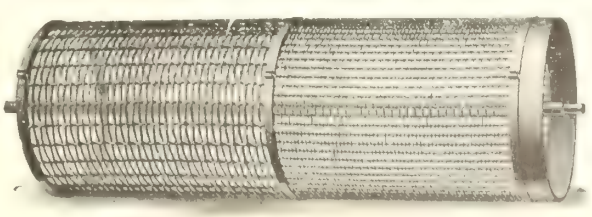

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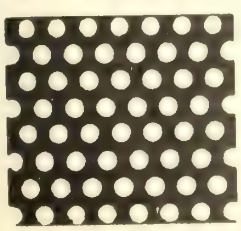
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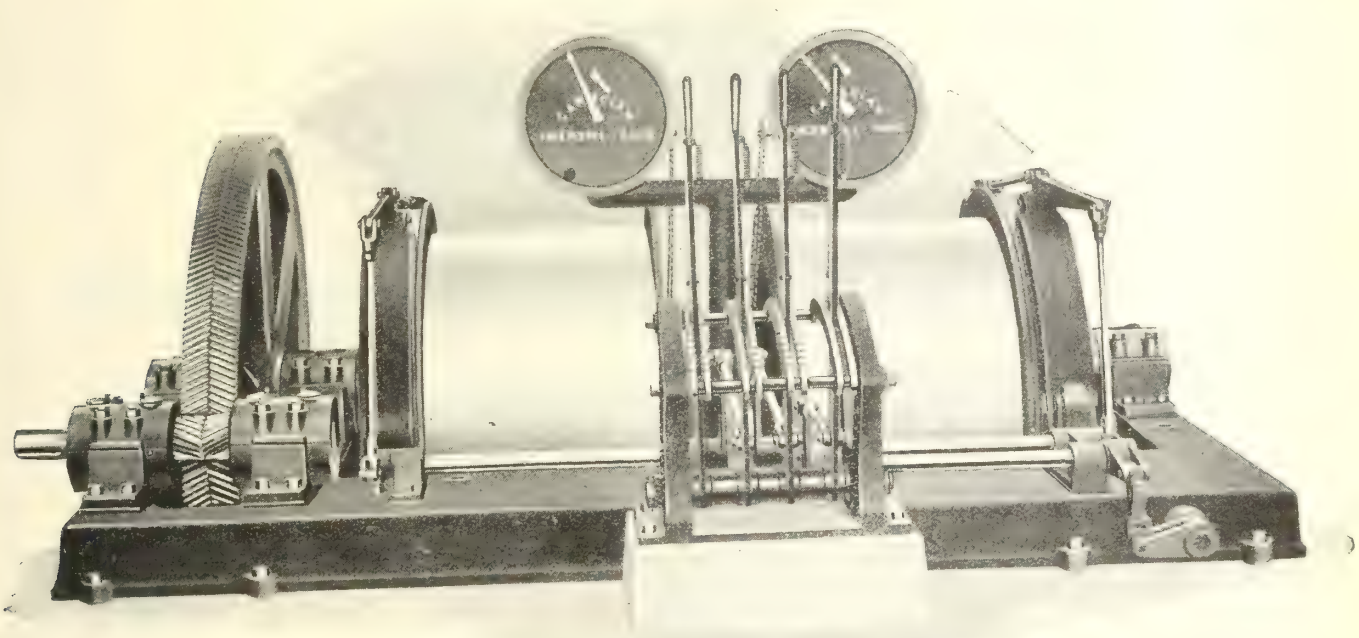

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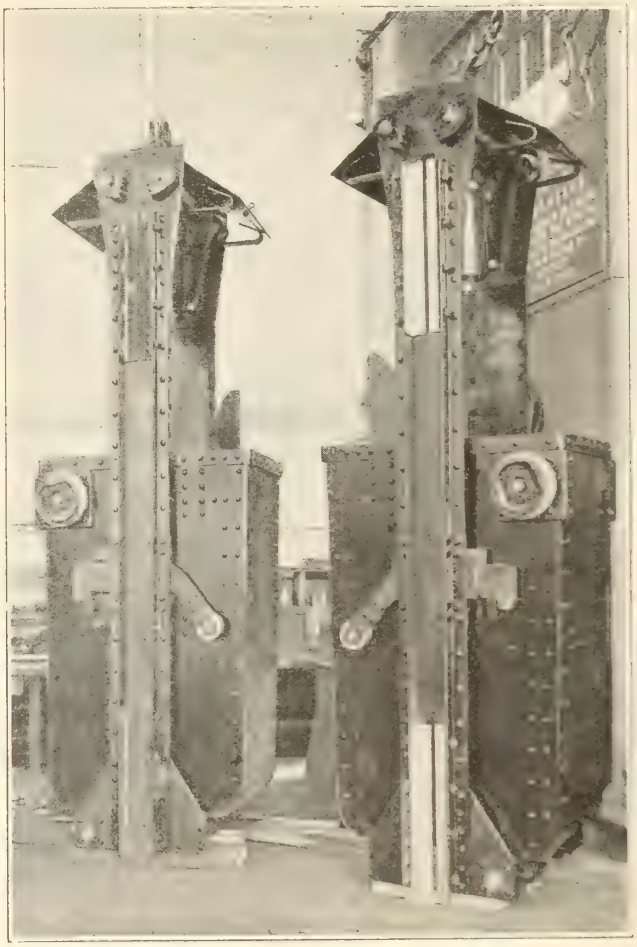

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Titanium, by A. H. A. Robinson.

Summary Report of Investigations made by the Mines Branch during the calendar year ending Dec. 31, 1921.

Phosphate in Canada, by H. S. Spence.

The Preparation, Transportation and Combustion of Powdered Coal, by John Blizard.

Road Materials along the St. Lawrence River, from Quebec Boundary to Cardinal, Ont., by R. H. Picher.

Barium and Strontium in Canada, by H. S. Spence.

The Coal-fields and Coal Industry of Eastern Canada, by F. W. Gray.

Analyses of Canadian Fuels. Part I to V, by E. Stansfield, M. Sc., and J. H. H. Nicolls, M. Sc.

Graphite, by H. S. Spence.

Gas Producer Trials with Alberta Coals, by J. Blizard and E. S. Malloch.

The Mines Branch maintains the following laboratories in which investigations are made with a view to assisting in the developing of the general mining industry of Canada:—

Fuel Testing Laboratory.—Testing value of Canadian fuels for steam raising and production of power gas; analyses, and other chemical and physical examinations of solid, liquid and gaseous fuels are also made.

Ore-Dressing Laboratory.—Testing of Canadian ores and minerals, to ascertain most economical methods of treatment.

Chemical Laboratory — Analyzing and assaying of all mineral substances and their manufactured products. Copies of schedules of fees, which are slightly in excess of those charged by private practitioners, may be had on application.

Ceramic Laboratory.—Equipment is such that complete physical tests on clays and shales of the Dominion can be made, to determine their value from an economic standpoint.

Structural Materials Laboratory.—Experimental work on sands, cements and limes is also undertaken.

Applications for reports and particulars relative to having investigations made in the several laboratories should be addressed to The Director, Mines Branch, Department of Mines, Ottawa.

GEOLOGICAL SURVEY

Recent Publications

Memoir 108. The Mackenzie River Basin, by Charles Camsell and Wyatt Malcolm.

Memoir 127. Beauceville map-area, Quebec, by B. R. MacKay.

Memoir 128. Winnipegosis and Upper Whitemouth River areas, Manitoba, Pleistocene and Recent deposits, by W. A. Johnston.

Memoir 129. Geology of the Moncton map area, by W. J. Wright.

Memoir 130. Geology and mineral deposits of the Bridge River map-area, British Columbia, by W. S. McCann.

Memoir 131. Kenogami, Round and Larder Lake areas.

Memoir 132. Geology and ore deposits of Salmon River district, British Columbia, by S. J. Schofield and G. Hanson.

Memoir 133. The southern part of the Sydney coal field, Nova Scotia, by A. O. Hayes and W. A. Bell.

Map 68A. Moncton, New Brunswick. Geology.

Map 155A. Portions of the districts of Algoma, Sudbury and Timiskaming, Ontario. Geology.

Map 1585. Mackenzie River basin, 1922 edition. Geology.

Map 1751. Wainwright, Alberta. Topography.

Map 1752. Monitor, Alberta and Saskatchewan. Topography.

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Map 1830. Vermilion; townships 47 to 56, ranges 5 to 10, west of the fourth meridian. Topography.

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Map 1948. Wanapitei Lake area, Ont. Geology.

Map 1964. Brockville-Mallorytown area, Leeds county, Ontario. Geology.

Map 1965. Fraser River delta, British Columbia. Geology.

Map 1972. Michipicoten area, Ontario. Geology.

Map 1977. Mackenzie river between Norman and Beaver river, district of Mackenzie. Geology.

Applicants for publications not listed above should mention the precise area concerning which information is desired.

Summary Report — The annual Summary Report of the Geological Survey is now printed in parts. Applicants should, therefore, state what particular geologist's report is required, or what subject they are interested in.

The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon.

Communications should be addressed to The Director, Geological Survey, Ottawa.

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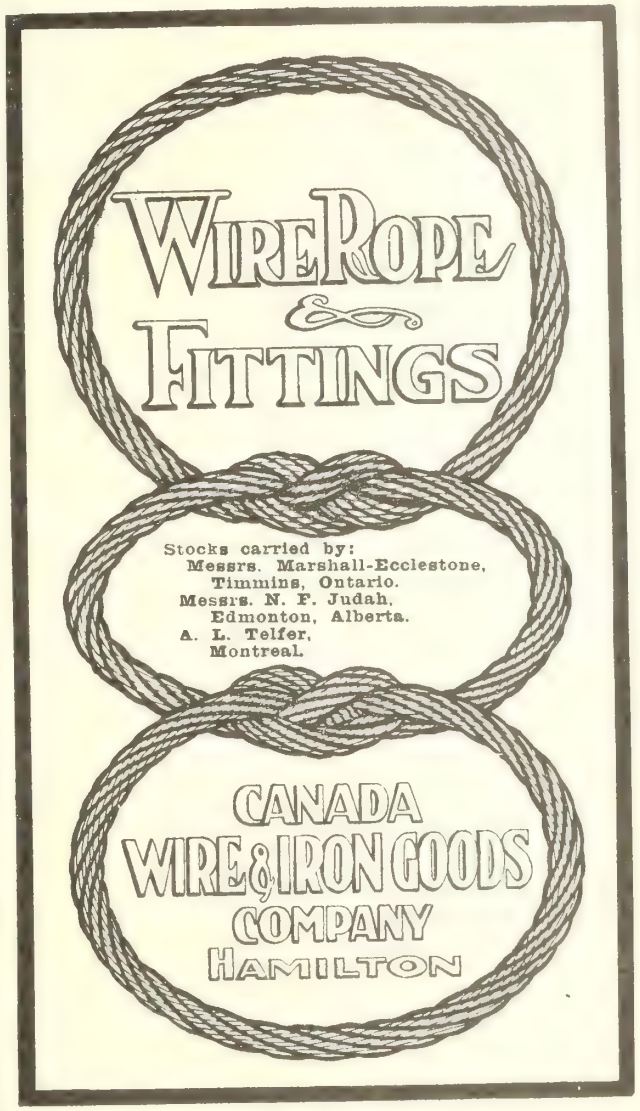
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Ontario's Minerals

PROVINCE OF ONTARIO

Hon. CHARLES. McCREA, Minister. DEPARTMENT OF MINES *Thos. W. Gibson*

Mineral Areas

Ontario, with its 407,262 square miles, contains many millions of acres in which the geological formations are favourable for the occurrence of minerals 70 per cent of the area being underlain by rocks of pre-Cambrian age. The phenomenally rich silver veins of Cobalt, Gowganda and South Lorrain occur in these rocks; so also do the far-famed nickel-copper deposits of Sudbury, the gold of Porcupine and Kirkland Lake, and the iron ore of Magpie and Moose Mountain mines.

Economic Minerals

In addition to the above, practically all economic minerals (coal and tin excepted) are found in Ontario: — actinolite, apatite, arsenic, asbestos, cobalt, corundum, feldspar, fluorspar, graphite, gypsum, iron pyrites, lead, mica, molybdenite, natural gas, palladium, petroleum, platinum, quartz, salt, talc and zinc. This Province has the largest deposits on the continent of talc, feldspar, mica and graphite.

Building materials, such as ornamental marble, limestone, sandstone, granite, trap, sand and gravel, lime, Portland cement, brick and tile, meet every demand.

Mineral Production

Preliminary returns show the output of the mines and metallurgical works of the Province for the year 1922 to be worth $62,202,169, of which the metallic production was $38,190,711.

The following figures show the growth of Ontario's mineral industry by five-year periods since 1891 when a Bureau of Mines was first established.

Year.	Value.	Year.	Value.
1891	$4,705,672	1911	$41,976,797
1896	5,235,003	1916	65,303,822
1901	11,831,086	1918 (Maximum war output)	80,308,972
1906	22,388,383	1921	48,128,387
	Dividends.		

Dividends and bonuses paid to the end of 1922 amounted to $28,096,699 for gold mining companies, and $86,238,185 for silver mining companies or a total of $114,334,884.

Mining Regulations

A miner's license costs $5.00 per annum, and entitles the holder to stake out in any or every mining division three claims of 40 acres each. After performing 200 days' assessment work on a claim, patent may be obtained from the Crown on payment of $2.50 or $3.00 per acre, depending on location in unsurveyed or surveyed territory.

Assay Office

The Provincial Assays Office at No. 5 Queen's Park, Toronto, is maintained by the Department of Mines for the free identification of minerals, free assays under the provisions of the Mining Act of Ontario, and also for general assay work as per the Schedule of Charges which may be obtained on application.

Temiskaming Testing Laboratories

The Department maintains, at Cobalt, an ore sampling and testing laboratory which is now prepared to receive parcels of gold ore from 100 pounds upward, and after sampling and assaying the same to pay to the shipper the value thereof, less treatment charges. The purpose is to afford a market for ores extracted by prospectors and others in developing their mining claims, enabling them to obtain funds which they can use for further work and to report on the most satisfactory method of treatment. Fuller information may be obtained on application to the Manager, Temiskaming Testing Laboratories, Cobalt, Ontario.

Publications

For list of publications, illustrated reports, geological maps and mining laws, apply to

Thos. W. Gibson,
Deputy Minister of Mines.
TORONTO, CANADA

PROVINCE OF QUEBEC

MINES BRANCH

Department of Colonization, Mines and Fisheries

The chief minerals of the Province of Quebec are Asbestos, Chromite, Copper, Iron, Gold, Molybdenite, Phosphate, Mica, Graphite, Ornamental and Building Stone, Clays, etc.

MINISTER OF COLONIZATION, MINES AND FISHERIES, QUEBEC

MINER'S CERTIFICATES. First of all, obtain a miner's certificate, from the Department in Quebec or from the nearest agent. The price of this certificate is $10 and is valid until the first of January following. This certificate gives the right to prospect on public lands and on private lands, on which the mineral rights belong to the Crown.

The holder of the certificate may stake mining claims to the extent of 200 acres.

WORKING CONDITIONS. During the first six months following the staking of the claim, work on it must be performed to the extent of at least twenty-five days of eight hours.

SIX MONTHS AFTER STAKING. At the expiration of six months from the date of the staking, the prospector, to retain his rights, must take out a mining license.

MINING LICENSE. The mining license may cover 40 to 200 acres in unsurveyed territory. The price of this license is Fifty Cents an acre per year, and a fee of $10.00 on issue. It is valid for one year and is renewable on the same terms, on producing an affidavit that during the year work has been performed to the extent of at least twenty-five days' labour on each forty acres.

MINING CONCESSION. Notwithstanding the above, a mining concession may be acquired at any time at the rate of $5 an acre for SUPERIOR METALS, and $3 an acre for INFERIOR MINERALS.

The attention of prospectors is especially called to the territory in the North-Western part of the Province of Quebec north of the height of land, where important mineralized belts are known to exist.

PROVINCIAL LABORATORY. Special arrangements have been made with POLYTECHNIC SCHOOL of LAVAL UNIVERSITY, 228 ST. DENIS STREET, Montreal, for the determination, assays and analysis of minerals at very reduced rates for the benefit of miners and prospectors in the Province of Quebec. The well equipped laboratories of this institution and its trained chemists ensure results of undoubted integrity and reliability.

The bureau of Mines at Quebec will give all the information desired in connection with the mines and mineral resources of the Province, on application addressed to

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The Mineral Province of Western Canada

Has produced Minerals valued as follows Placer Gold, $76,542,203; Lode Gold, $109,647,661; Silver, $59,814,266; Lead, $51,810,891; Copper, $170,723,242; Zinc, $24,625,839; Coal and Coke, $238,289,565; Building Stone, Brick Cement, etc., $36,605,942; Miscellaneous Minerals, $1,358,839; Making its mineral production to the end of 1922 show an

Aggregate Value of $734,259,619

The substantial progress of the Mining Industry of this Province is strikingly exhibited in the following figures, which show the value of production for successive five-year periods: For all years to 1895, inclusive $94,547,241; for five years, 1896-1900, $57,605,967; for five years, 1901-1905, $96,509,968; for five years, 1906-1910, $125,534,474; for five years, 1911-1915, $142,072,603; for 5 years 1915-1920, $189,922,725; 1921, $28,066,641; for the year 1922, $35,158,843.

Production During last ten years, $339,280,940

Lode-mining has only been in progress for about twenty-five years, and not 20 per cent. of the Province has been even prospected; 300,000 square miles of unexplored mineral bearing land are open for prospecting.

The Mining Laws of this Province are more liberal and the fees lower than those of any other Province in the Dominion, or any Colony in the British Empire.

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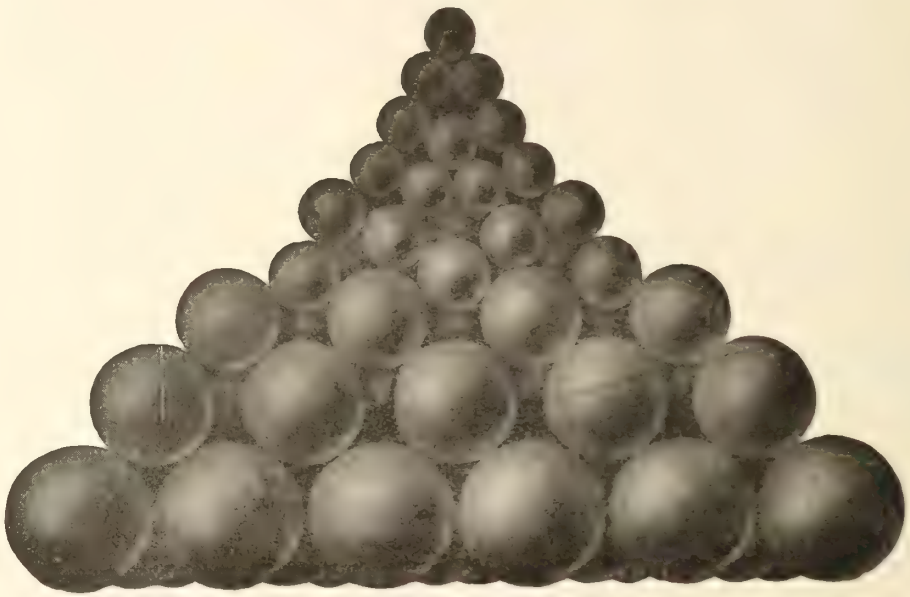

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CANADIAN MINING JOURNAL

PUBLISHED WEEKLY

Devoted to the Science and Practice of Mining, Metallurgy and the Allied Industries; and more particularly to their progress in Canada

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O.W. Ludwig, *Plant Superintendent of the Raymond Lead Co., Chicago, says:*

"Thirteen years of service without a repair is our experience with two 100 H.P and ten 20 H.P. Morse Silent Chain Drives

"When we moved into our present plant thirteen years ago, we installed the present Morse equipment of silent chains for our two lead mills and ten hydraulic pumps. We had always previously used leather belts, but not without considerable trouble. For instance, if the operator was not careful — and gave the motors too great a load, the leather belt would slip and in some cases burn out. While with the Morse Chain Drive we overload them at times up to 15 H.P. without the slightest trouble.

"When we used leather belts on the hydraulic pumps, if a pump packing suddenly gave way, the water would squirt all over the pump as well as adjoining pumps, causing the leather belts to get wet. This often necessitated a shut-down on 3 to 4 pumps to dry out each belt, thus causing a loss of time by the men, which resulted many times in paying overtime to catch up on the work. Of course, with our Morse Chain Drive we have no such trouble—this positive drive prevents slippage and is not affected by water.

"Leather belts lasted us 2 to 3 years at the most, while our Morse Chain Drives have already lasted 3 to 4 times that long and seem good for many more years. So Morse Drives have cut our expense materially, speeded up production, cut out overtime wages and saved floor space, for they operate on shorter centers."

:-: EDITORIAL :-:

NEW RAILWAYS FOR THE MINES

Of the very few pieces of railway construction under way in Canada at present, those in northeastern Ontario and northwestern Quebec are probably of most interest to mining men. Construction of the Larder Lake branch eastward from Swastika is well under way, and the Kipawa extension of the C. P. R. to des Quinze is nearing completion.

The extension from Kipawa to the water storage dam on des Quinze river where it flows from des Quinze lake is 68 miles long. At present the end of steel is within a few miles of the dam, and the construction engineers expect to have it at the dam by October first. The grade is almost completed throughout. There is a four-mile spur line from St. Placide to Ville-Marie, the county town, on Lake Temiskaming, the seat of the local mining recorder's office.

While the railway, at its present terminus at des Quinze dam, is pointed in the direction of the gold belt to the north, it is at a distance of 45 miles, and there is no assurance whatever as yet that it will be carried through. It is interesting to note that only the long-continued urgency of the community of 17,000 settlers round about Ville-Marie has brought the railway through to them. Even then, the Provincial Government has had to grant the C. P. R. a substantial cash bonus per mile and a concession of agricultural land of much greater potential value, to induce them to put their road through the 35 miles of difficult and barren land from Kipawa northward. The remaining 33 miles is through good farming land, which would attract any railway.

The interesting point to the mining fraternity is whether this Kipawa extension will be pushed northward. It can be said with certainty that no mines, alone, will induce this. We must remember that a single set of rails will outlive the average mine. Settlement is the great inducement to railway building; the farms will last forever. But mining will induce immediate settlement, so that it will require the conjunction of payable gold deposits and good farming land to draw the C. P. R. northward from the Quinze. The good land is there in abundance, but the mines have still to be proved.

Piquancy is added to the situation by the fact that the branch eastward along the gold belt from Swastika to Larder Lake will be within 17 miles of Lake Fortune before the year is out, and by the additional fact that it is being built under a federal charter. Will the T. & N. O. Railway Commission get to the prospective Quebec gold mines first, and draw the traffic down their line towards Toronto? This makes interesting speculation.

THE VALUE OF CONFIDENCE

In an inspiring address to the Canadian Club in Vancouver on Sept. 2th, Sir Edward Grigg outlined the probable direction in which the Imperial Economic Conference would be guided.

The keynote of Sir Edward's remarks was that the ways and means of arriving at economic provisions must be subordinated to the definition and acceptance of fundamental principles. Constitutional machinery may become ineffective and the assumption of obligations for the future enforcement of a stated policy may prove to be unacceptable when the time comes for its exercise, and may in fact impair the freedom of action that a changed situation demands. Thus principle rather than expediency must be the keynote of the Conference.

The genius of British foreign policy was described as being embodied in the principle of avoiding definite commitments to any single power or group of powers and dealing with each situation as it arises. Such a policy, if considered alone, might be described as pure opportunism, and it was forcefully pointed out that its vindication as well as its power lay in the firm adherence to an ideal purpose.

The purpose of British foreign policy to-day is the attainment of peace and settlement, and every situation that arises is dealt with in its relation to this purpose. The best work that the Imperial Economic Conference can do, the most efficient way in which it may seek to benefit the economic conditions of the Empire, is by setting itself to establish relations in accord with the ultimate requirements of peace and settlement, rather than by the formulation of arbitrary measures or creation of machinery that a future generation may repudiate.

The basic provision of the Treaty of Versailles, which called for the joint action of the United States and the British Empire in support of France, should she be attacked again by Germany, already repudiated by one party and disallowed by the other, is startling evidence of the futility of attempting to impose definite obligations in respect of indefinite or hypothetical situations.

There is a moral in all this of very pertinent applica-

tion to the mining industry of Canada. As peace and settlement are the dominant objectives of world-policies to-day, so confidence and reciprocity of thought are the essential requirements for the well-being of Canada's mining industry. To what end? — To the end that capital may be interested, — capital to investigate, to open up, to make liquid our mineral assets.

Just as economic stability is to be sought in the train of peace, so will an atmosphere of confidence do more to attract the investor than the most strenuous efforts for publicity for the mining industry.

It is the duty of everyone who is genuinely interested in the advancement of the mining industry (and this we deem our especial privilege) to do his utmost to inspire confidence, and that can be done only by a frank presentation of all pertinent facts and an open discussion of the whole matter, not forgetting the point of view of the man outside the industry.

GOOD ROADS WITH POOR SURFACES

At this season of the year it is the custom of our road builders to commence sizing up the result of their year's effort. The "good roads" movement is having a very satisfactory result, in all but one respect; many of the good roads are poor roads.

We have drawn attention on numerous occasions to the fact that, almost without exception, soft rock of inferior wearing quality is used to surface our roads—even our "good" roads — wherever it is available. We have seen more than one instance of roads surfaced mile after mile with limestone rock, when good, hard trap rock was available in the immediate locality. It does not seem to strike our builders of roads that it is an excellent investment to use the trap rock. Though it may cost a trifle more to quarry, crush and roll the harder rock, its useful life is anywhere from three to ten times as long.

Surely this is not stupidity or mere "cussedness" on the part of our builders of roads; it must be due either to the force of habit or to ignorance. Let us give them the benefit of the doubt, and say that they are wasting vast sums annually in putting down shoddy macadam, a fast-wearing concrete aggregate, and an inferior filler with their asphalt because they do not realize the facts of the case. "Penny wise and pound foolish" is costing the country millions annually in soft road surfaces.

How can this waste be prevented? — Very simply; by using good rock wherever it is economically available. Fortunately, good road material is fairly well distributed throughout eastern Canada, where the principal road-building investment now is in progress. The Mines Branch, Ottawa, has examined and reported upon the road-building materials of a large part of these eastern provinces. Unfortunately, these reports do not emphasize sufficiently the superior value of hard rocks such as trap over even the best of limestones.

We have a suggestion to make, which may be of practical utility. The Mines Branch has a fund of useful information on road-building materials, and has the facilities for gathering more as required. Its officers can demonstrate in numerous ways the economy of using good rock for surfacing our permanent roadways. Let our practical road builders and their business executives consult these technical officers, and among them they will work out ways and means of lessening the present appalling annual waste due to shoddy surfaces.

THE LAST OF A DISGRACEFUL EPISODE

Last winter the Labrador stock-jobbing campaign was preceded by preparatory paragraphs in the daily papers, making the public ready for the flaring advertisements that were to follow. Immediately these paragraphs appeared, the *Canadian Mining Journal* got in touch with a well-known mining engineer in Newfoundland, and on the basis of the information he supplied exposed the whole infamous project. Recently we asked this same authority for the facts as determined during the past summer, and he has replied as follows:

"While I did not go to Labrador myself, I have interviewed all the returned prospectors, with the result that there is no question that the whole thing was one of the most bare-faced swindles in my experience of mining.

"The original discovery by Bellew was a fake.

"The reported discovery by the Stanley May party was due to the salting of the samples taken. The opinion of Captain Jeffreys is that the salting was done after the samples reached Montreal.

"Mr. Casson, who accompanied the Jeffreys party this summer, coming from California to do so, stated that in his opinion there was not a colour of gold within fifty miles of Big Brook, Stag Bay, where the supposed discoveries were located. Mr. Wilson of Timmins said the same, as did also Captain Thomson of Liverpool, England.

"Captain Jeffreys is firmly convinced there is no alluvial gold on the Labrador. Fred Chalmers, who is a prospector of many years experience and who took a party from St. John's, made the same statement.

"Furthermore, all these men stated that the formation was all glacial on the coast for many miles and consisted entirely of detritus from granite; that the reported black sand was ground-up hornblende; that for thirty miles back from the coast no other formation but granite was encountered. All these men were very indignant over the whole thing.

"In my opinion, responsibility for the hoax rests primarily upon Bellew, who unquestionably lied. In the second place it rests upon the Stanley May party, who, in spite of having an experienced engineer with

them, allowed their samples to be salted. I believe no blame attaches to Mr. May, who was convinced that gold was there, probably in paying quantities. In the third place, the Newfoundland government should be severely censured for not sending a competent man to investigate the alleged discovery as soon as it was reported."

This engineer in Newfoundland has done a public service in keeping the *Canadian Mining Journal* posted as to some of the facts of this disgraceful episode. It does not seem likely that the culprits will be prosecuted or made to repay the sums got from the public on false pretences. At this point we shall write finis to the affair.

A SILVER PROSPECT IN QUEBEC

While the present productive area of the South Lorrain silver camp is confined to the hundred acres or so in which the Keeley and Frontier ore-shoots have been developed, further underground prospecting now under way promises to extend the field. Active development is in hand on some of the adjoining properties, and at least one outlying property, the Maidens, two and one-half miles to the northeast near the shore of Lake Temiskaming, is to be investigated thoroughly.

The evidence upon which the Maidens property is deemed worthy of investigation is cited by Mr. C. W. Knight in his recent report on South Lorrain. It consists, in brief, of the presence of well-defined and wide calcite veins containing smaltite and occasional low values in silver, occurring in rock of Kewatin age. This rock is underlaid by the same sill of diabase that appears at the Keeley and Frontier. The contact of the two rocks has not been explored where cut by the veins. It is hoped to find ore-shoots there.

There is a case that appears to be somewhat similar, and likewise worth investigation, six miles to the east, across Lake Temiskaming in Quebec. In Fabre parish, one and one-half miles east of the hamlet of Fabre and four miles east of Fabre wharf, there were discovered in 1906 two or three veins of smaltite in Keewatin greenstone, which is underlaid by a sill of Nipissing diabase. These veins are up to two inches in width, and show a little silver on assay. In 1907 a shaft was sunk on one of these veins for a distance of 50 to 75 feet. At this point the Keewatin rock is probably 100 to 125 feet thick over the sill, so the shaft probably was sunk about half way to the contact.

This old prospect has been idle since 1907. The Kipawa extension of the Canadian Pacific Railway now runs within less than three quarters of a mile east of the property. It could be explored cheaply. Will the present interest and activity in South Lorrain spread eastward across the lake into Quebec?

EMPIRE MINING AND METALLURGICAL CONGRESS TO BE HELD AT THE BRITISH EMPIRE EXHIBITION, 1924

His Royal Highness the Prince of Wales has consented to become Honorary President of the forthcoming Empire Mining and Metallurgical Congress.

The following institutions are co-operating as convenors of the Congress which will be held at the British Empire Exhibition in London during the first week in June, 1924:—

The Institution of Mining and Metallurgy,
The Institution of Mining Engineers,
The Institution of Petroleum Technologists,
The Iron and Steel Institute and,
The Institute of Metals,

representing the Scientific and Technical interests of the Mineral and Metal Industries, with

The Mining Association of Great Britain and
The National Federation of Iron and Steel Manufacturers, representing the Colliery Proprietors and Iron and Steel Manufacturers respectively, of the British Isles.

This is the first Empire Mining and Metallurgical Congress to be held and it is anticipated that succeeding sessions will be held in the Dominions under the auspices of an Empire Council of Mining and Metallurgical Engineering Institutions, which it is hoped will be constituted as a result of the inaugural Congress.

Viscount Long of Wraxall (late Secretary of State for the Colonies) has accepted the invitation of The Institution of Mining and Metallurgy to deliver the "Sir Julius Wernher Memorial Lecture" at the opening Session of the Congress, and he will take as his subject Mineral Resources and their relation to the prosperity and development of the Empire. The "May Lecture" of the Institute of Metals to be delivered by Dr. F. W. Aston, F.R.S., will also form part of the programme of the Congress. Dr. Aston's subject will be "Atoms and Isotopes".

CORPORATIONS THAT BELIEVE IN RESEARCH

Twenty large manufacturing corporations in the United States, whose names appear below, maintain extensive Industrial Laboratories. Why? Because it pays.

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General Motors Company.
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International Acheson Graphite Company.
National Carbon Company.
National Cash Register Company.
National Electric Lamp Association.
New Jersey Zinc Company.
Pennsylvania Railroad Company.
Reo Motor Company.
Studebaker Corporation.
T. A. Edison Laboratories.
Westinghouse Electric and Manufacturing Company.
Western Electric Company.

We have similarly enlightened corporations in Canada, but not enough of them.

The Pas Mineral Belt in 1923

Report to the Commissioner of Northern Manitoba

By R. C. WALLACE

In the mineral belt north of The Pas as a whole, there has been a comparatively quiet period since the operations of last summer. The most important progress has been at Herb Lake, where the Bingo interests are pursuing a programme of underground development with very satisfactory results. Further work at Herb Lake, both in gold and silver-lead, very promising development work in gold at Elbow Lake, and further operations in diamond-drilling and intensive prospecting by the Flin Flon interests, with some other work in the copper belt, constitute the major operations of the season. Although the work done has been rather limited, in several areas it calls for special attention, owing to its significance for mining interests who are keeping in close touch with developments in this field.

The operations in this district may be grouped under three headings: (1) copper, (2) gold, and (3) silver-lead. In a general way, this represents also the order of mineralisation from west to east in the belt.

Copper

Copper prices and the copper market have not been strong in recent months, and work in the copper area has been affected accordingly. The Flin Flon interests are continuing diamond drilling operations, and are at present working southeast of the main ore-body. They have also a fairly large party under Dr. Armstrong carrying out a programme of intensive prospecting in the district.

In the main, prospectors are confining their attention to the Northeast Arm of Athapapuskow lake, in the vicinity of Sourdough Bay, where the indications appear to be the most favorable for the discovery of further copper ore-bodies.

Little has been done on the Baker-Patton group since last summer, when considerable surface trenching was done by the London Exploration Company. The property can best be explored by diamond-drilling, and at relatively small cost. Towards the south end of the Neo claim, and at the north end of the Zero claim, shallow holes across the muskeg would give valuable information on this property, which is now held under option. Somewhat east of the strike of the porphry schist on this group, very good copper ore appears as float on the east side of an island on Thompson Lake (Don Juan claim), apparently almost in place, under the lake surface. This will be trenched when the water level lowers in late summer.

To the west of the Baker-Patton group, on the Rosen claims and adjoining properties to the south, in a sheared greenstone west of Stewart lake, considerable mineralisation with chalcopyrite occurs, in places showing good values. When prospecting for copper ore-bodies becomes general, the west shore of Stewart lake will be diamond-drilled, as one of the likely areas in this district. On the east side of the Northeast Arm, a substantial body of iron sulphide occurs, with a showing of copper on the Fox claim. Little work has been done in this zone of mineralisation.

The showings on the Northeast Arm indicate that both in the quartz porphyry and in the associated greenstone, mineralisation with sulphides of iron and copper is general in several parallel zones. The edges of the lakes, the muskegs and low-lying clay-covered areas in these zones, where copper is fairly abundant in the adjacent higher ground, are good prospecting ground by diamond-drill for copper ore-bodies.

Gold

Bingo — Underground work is proceeding at the Bingo mine, on the east side of Herb Lake. The shaft had reached a depth of 225 feet at the beginning of August, and sinking was to be continued to 400 feet. Approximately 310 feet of drifting has been done on the 200-foot level north and south of the shaft, and a cross-cut has been run (50 feet) from the north drift, and another (80 feet) from the south drift, crosscutting on both sides of the drift. The underground work to date shows the vein on which the shaft was sunk, and the parallel vein to the east, continuing downwards in very well-marked fissures. On both walls in each vein considerable movement has taken place, with good promise of continuing in depth. The quartz shows more volume than at the surface, with considerable widening between the 50-foot and 100-foot depths, and carries a good deal of galena with the pyrite. The country rock, which dips with the veins approximately 75 degrees east, is a sheared fine-grained acidic lava, well shattered on the footwall, and cut by numerous stringers of quartz. In the free gold showings in the vein-stuff, as for instance below the 200-foot level, the gold appears to be associated mainly with the galena but is very clean and is presumably almost completely free-milling. The equipment installed for development purposes is complete, and work is proceeding rapidly and efficiently, and at low cost. A staff of 25 men is employed, working in three shifts, and the sinking is being carried on by contract. Altogether, developments are of a very encouraging nature on this property, and bid fair to assist in a material way the whole Herb Lake camp.

Murray — On the Murray property, at the south end of Elbow Lake, on which considerable surface work was done by the Hollinger interests last year before relinquishing their option, further work has now been done in following the high-grade showings in the low-dipping veins or sheets cutting the altered contact complex which forms the mineralised country rock on the property. Underground work will be necessary in order to determine the structure with accuracy; but the sheets appear to dip to the northwest with an average angle of 35 degrees, with occasional folds and reverse dips, the quartz filling later cross-fractures in a vertically dipping country rock. Two sheets have been followed by deep trenching which shows unusually heavy free gold on the footwall practically throughout the workings. The shaft has been sunk to 42 feet, and the shattered country rock at the bottom of the shaft carried values in gold. Development work on the property will doubtless be concentrated on the quartz sheets, and the continuation of the tunnel to crosscut the sheets will be of considerable assistance in planning a development pro-

gramme on the property. The present surface showings and values justify a programme of development, not aimed at large-scale operations on the quartz and country rock, but confined to the quartz sheets on which recent surface work has been done. The property is fully equipped with buildings which have been well cared for by the present management.

Elbow Lake — In the Elbow Lake area are several so-called "porphyry dykes"—parallel zones of shearing in a porphyry schist, impregnated with veins and stringers of quartz, and in many instances carrying a considerable proportion of iron carbonate. On account of their width and continuity, these zones are attractive, and a good deal of work has been done on several of them. Unfortunately they have hitherto showed from cross-channeled samples too low values in gold for successful operation in this district. On the Garbutt zone, one of the strongest in the district, Webb has now uncovered a shoot that may have important significance. On the quartz stringers across the zone, and with some lateral continuity, there are abundant free gold showings associated with galena. From a 2-foot widening of one of the quartz veinlets in particular, a very fine ore has been cobbed for treatment. There is not yet enough work done to determine the extent of the shoot; but it is of importance in indicating that at least one shoot occurs in this type of zone, and that the chances are reasonably favorable for other shoots being found on careful prospecting. What is needed here, and on other zones similar to the Garbutt, such as the Shamrock group, the Point showings, and the Bank group, is that companies be given the opportunity, and be obligated, to do extensive work on their options without any considerable payments to owners for a sufficient length of time to permit of such zones as the Garbutt to be thoroughly prospected. On that basis good companies will be attracted, and real progress will be made.

As an illustration of the value of careful surface prospecting, there has been uncovered in the northeast end of the Herb Lake area on property that had been staked and re-staked without any work being done (the Byng claim) a fairly strong vein of quartz running across the strike of the porphyry schist, and fissured like the quartz of the Rex vein. Prospecting of this kind is needed on many properties that have now been held for some time, as the statutory assessment work is too often of very little value in prospecting the property.

Lead-Silver

A galena-silver mineralisation occurs in the sediments on the north end of Herb Lake, and a considerable amount of development work has been done on the outcrop north of the Little Herb river by Paul Gasse for American interests. The rock is an almost flat-bedded quartzite, underlaid by a soft mica schist, and flanked on the west by a coarse pegmatite, which has intruded the sediments. The work on the shaft and crosscut shows that the silver-bearing galena is confined to the quartzite, which extends to a depth of 17 feet at the shaft. The galena occurs in bands in the sediments, the main band striking 20 degrees east of north. The most northerly trench in this zone shows very heavy mineralisation with galena over a width of 20 feet. The ore seems to increase in width and value towards the north, and there is good prospecting country in the clay-covered country north of the north trench. The silver averages $1.30 to every unit percent of lead. Massive sphalerite has been uncovered immediately east of the main galena mineralisation, though apparently not associated with the galena.

Rumors of a native silver discovery somewhere between the mineral belt and the Churchill river have resulted in several parties going northwards through Kississing lake to the Churchill river and Grenville lake. To date the explorations have been unsuccessful in the search for silver. A large iron sulphide body was discovered in the Kississing lakes, on which some sampling has been done. Under present conditions of transportation it is obvious that only high-grade ore-bodies of large size would be of any economic value in territory so far removed from the main avenues of transportation.

Summary

Both at Herb Lake and Elbow Lake the outlook is decidedly encouraging for the development of gold properties. The underground results on the Bingo at Herb Lake, and the surface discoveries on the Murray and Garbutt properties at Elbow Lake, will attract the attention of responsible mining companies to both districts. With renewed activity, it is hoped that owners will feel their responsibility in prospecting their properties, and seeing to it that the assessment work is done to good advantage to themselves and the whole district.

The world copper situation has affected progress in the copper area, but there are indications that underground prospecting will continue, particularly in the Northeast Arm of Athapapuskow lake. To judge from surface showings, the chances for ore-bodies being discovered in that area are good.

Work is proceeding rapidly to determine whether the galena-silver occurrence in the sediments on the Little Herb river is sufficiently extensive to grade as an ore-body. Much work will yet be required before the extent of the mineralisation in a heavily clay-covered country can be fully estimated.

PERSONAL AND GENERAL

An indication of the wide-spread effect of a prosperous mining industry is the recent appointment of Mr. N. A. Timmins, President of Hollinger Consolidated, to the board of directors of the Riordon pulp and paper company.

Mr. E. L. Marthelem has been appointed electrical engineer for the coal mining operations centered round Glace Bay, Nova Scotia.

Dr. J. A. L. Henderson of London, consulting engineer to the Anglo-French Exploration Company, is in Canada in the Company's interest.

During recent years an additional and substantial amount of petroleum has been won from abandoned fields in France and Belgium by underground mining methods. When the petroleum-bearing strata are not too deeply buried, it has been found profitable to sink shafts and from there to run drifts into the strata, into which the oil percolates. Dr. Charles Camsell, Deputy Minister of Mines, will examine these fields before he returns from Europe, with a view to gauging the applicability of this method to the shallow oil-fields of southwestern Ontario.

Canada's developed resources are said to be worth from eighteen to twenty-five billion dollars. In ten years of systematic scientific experiment, we believe they would be worth one hundred billion dollars.

Some Thoughts about Currency

By H. G. NICHOLS

Considering the practical importance of the subject of currency to the man in the street, it is remarkable to note how few people have any very clear idea of the problems connected with it, and the diversity of opinions expressed by those who have thought about it most affords some excuse for venturing upon the discussion. That the question of currency is one of particular interest to the mining fraternity is evidenced by the discussion recently initiated by the Institution of Mining and Metallurgy in London, and carried on by the English technical press. It is perhaps a pity that this discussion was restricted to the consideration of the re-valuation of gold, for that, after all, is only one suggested means to an end.

Throughout many centuries, it has always been the question of how individual interests are to be related to one another that has given rise to the complexities of the currency problem. In the latter part of the last century the conception of the necessity for some form of universal medium had been reached, and found expression in the proposition laid before the Paris conference of 1878, that "the use of both gold and silver as unlimited legal tender may be safely adopted; first by equalizing them at a relation to be fixed by international agreement, etc." But the time was not yet ripe for the acceptance of the universal or international application of a fixed ratio. It has required the events of recent years to establish the common cause of humanity as a fundamental principle in business relations. And it is because the common good as the motive force in world-policies today is before the nations that we may again approach this subject with an open mind, considering it as a matter of first principles and divested of the incubus of former dialectics. This is not an easy matter; even the simplest-sounding axiomatic definitions are liable to go astray, from force of habit.

What is "Value?"

The very first point to be studied is in connection with the abstract idea of value. Take three commodities, wheat, iron and coal, and suppose they are being used for the sole purpose of ballasting a ship; then their interchangeability would depend upon their weight, and it would not matter whether their weights were gauged in poods, pounds or kilos, they would have to balance up against so many cubic feet of water. Weight is an abstract idea, then, that is not explained by the symbols employed, but only expressed by them, and these symbols would be useless unless they were invariably true to the central idea of weight. The use of our three commodities then is as weights; their interchangeability is determined by a common requirement.

Let us call the weight of a cubic foot of water .. .. w

and the weight of a cubic foot of wheat .. .. $\frac{w}{a}$

and the weight of a cubic foot of iron .. .. $\frac{w}{b}$

and the weight of a cubic foot of coal .. .. $\frac{w}{c}$

One may be changed for the other in the ratio, a : b : c; but the extent to which any of them may be used for our purpose depends upon the constant w, and you can take so many poods, pounds or kilos of wheat, iron or coal, knowing that you are dealing in equivalents of one invariable factor; there is nothing to choose between them.

Now let us consider our commodities as cargo rather than ballast. There is now something independent of their weight, to choose between them. Wheat may be wanted at the port where the ship is going; you choose it because it is needed. It is a question of needs. How many needs are there? You may say their name is legion; but we require to go back farther than that, to the *idea* of need—just as we have seen that there may be many weights but only one *idea* of weight.

The Criterion of Value

We have reached a stage in the world's history at which world-conferences admit one dominant criterion of policies,—the need of the human race. This is the fundamental principle to which the economics of trade-relationship must be referred and to which national considerations must be subordinated; that is, international trade-relations and international exchange problems have largely superseded the purely national problems.

We reach a simpler definition of

value .. .. *world-worth;*
and for *money* .. .. .. *the expression of worth;*
and for *price* .. .. *world-money-worth.*

Observe that money is not the expression of the *degree* of worth; there may be many degrees, as there are ounces, pounds, kilos, poods; but as there is an absolute weight, so there is absolute worth of world-wide application. Thus we have true comparison of the value of commodities.

This last phrase brings us to the ways and means of valuation. Here we must go warily. We are speaking of general principles, not of the complexities that in point of fact confront us. We require a symbol of worth by which fluctuating degrees of value may be reckoned. We might choose any commodity, and say, "Let that be our symbol;" and, having chosen it, consider it to represent an unalterable conception. This is the fundamental axiom, and it requires to be followed up in its simplicity before considering the complexities that follow.

Dependent upon the absolute nature of worth, there should be a proportionate equivalent of the material possessions of the world in worth tokens. Relativity, in the last resort, predicates an abstract and integral conception. Relative values imply an abstract conception of indivisible value. As relative values are expressed, for purpose of exchange, in terms of currency—as "price"—currency itself must be based upon an unchanging expression of value. It follows that, whatever the unit of value may be, multiplication does not affect its intrinsic worth, and division is impossible.

Universal Standard Required

In order that the legitimate effects of world-production and consumption may be proportionately represented in terms of currency, a universal standard of value is demanded. The most convenient manner of expressing value lies in the choice of a suitable material, the requirements being ease of distribution and indestructibility. If it appears that, owing to the volume of trade, the supply of the chosen materal is inadequate for the requirement, the choice of a second material to represent it is legitimate. Factors affecting such a choice are such as the

ratio of production of the two materials, which serves to indicate the ratio of value between them; also the adaptability of the satellitic coinage to individual national usage. The word "satellitic" is used to imply that the function of the second material, as currency, is absolutely dependent upon the material it is used to represent, and that it can have no fluctuating prerogatives of its own, neither can they be forced upon it.

The practical trouble with the world's currency to-day seems to be, (1) an insufficiency of real currency of intrinsic value, and (2), a clashing of national interests due to the unstable substitution of fictitious currency for real currency.

The need of the world to-day seems to be unification and equalization of trade-relations, and it also seems to follow that relief may be found in the universal adoption of silver as a basis of currency. And so the problem appears to have a two-fold aspect. First, we require to be released from the paper currency embroglio; and second, we need an adequate means for international valuation.

Augmented Metal Currency Needed

Looking at the facts of currency obligations, it would appear that, even if the whole of the world's gold were in Europe, a re-valuation of gold to permit of the absorption of excess paper currency would merely introduce international complications of immensely graver import than those that already exist; it could be only a national expedient, and it is world-finance that is sick. The supply of currency is insufficient; otherwise there would not be all this paper. And if the intrinsic value theory of currency is correct, the remedy lies in creating a substitute for gold to do duty for it in all countries, and especially in those where gold is not to be had.

It is not for the uninitiated to discuss problems such as the relation between the Bismarckian coup of 1873 and the present cataclysm of insolvency; and, maybe there is small hope of unanimous opinion even among the initiated in regard to the difficult and diverse problems of present day finance. But if the principles of inherent worth and of the common good call for an increase in the metal currency of the world (and this is the substance of my argument) expediency will win over habit, and means will be found to make our conventional tokens of worth serve more adequately humanity's need.

ANOTHER RAND?

The *Afician World* states that a five-stamp battery is being set up in the locality of the Masai Reserve near the border of the Tanganyika territory, were prospecting areas have been pegged for many miles along the course of the reefs . Whether the venture be successful or not, he would be a bold man who would assert that the resources of Africa for gold mining have been by any means yet ascertained. The Rand—which has produced, and may yet produce, more gold than any gold bearing area that has ever been worked — was discovered by a fluke. An edge like that of a tilted saucer, bearing gold outcropped, and was detected to contain gold. Had this not projected from the surface, the immense mass of gold bearing ore at depth would have remained one of the secrets of Nature.

1370 Per Cent

The E. J. Du Pont de Nemours and Company of Wilmington, Delaware, manufacturers of explosives and chemicals, estimate that their research laboratory has yielded a profit of $82,401,000 from 1912 to 1918, inclusively. This represents a yearly return of 1370 per cent. on their investment for research.

Letters From Readers

INDUCTION AND DEDUCTION

To the Editor,
Canadian Mining Journal.

The reference to induction in Mr. Campbell's article in your issue of September 7th suggests that a brief discussion of the complementary psychological processes, induction and deduction, may be of interest to readers of the "Journal." These scientific terms merely express more precisely the common processes of reasoning used, almost unconsciously, by every normal person, in his ordinary daily experience. Without induction in the widest sense, there would be no generalization, and little if any intellectual progress.

Induction is the mental process by which experience becomes of value. There would be no accumulation of the fruits of experience, no ripening of experience into sound judgment, but for this rational process. It is the intelligent aspect of experience—that wherein man differs chiefly from the lower animals, which are generally assumed to be incapable of consciously generalizing from their observations and experiences.

Induction, in any real sense, cannot lead to absolute truth. In its approach to certainty it is progressive. When it reaches certainty, it may cease to be real induction and become a mere shortened statement to avoid repetition.

Science is founded on, and built up by, induction. Engineering, based on science, advances with its progress. Without induction, therefore, there would, or indeed could, be but little advance in engineering.

Scientific use of induction springs from discernment of underlying principle. Hence, it may be used as the basis of prediction, within the limits indicated by the believed extension of the principle. Indeed, fulfilment of prediction is usually the best test of the accuracy of an induction.

But this use of induction brings forward its companion process, deduction, which is predictive, forward-looking, progressive, and without which induction would not get us very far. The two processes are inseparable. The one implies the other. They are respectively the backward- and forward-looking aspects of the same process. But deduction, being forward-looking, can only follow, it can never precede, induction. The human mind proceeds from the known to the related unknown.

Scientific use of deduction is also dependent on the discernment of principle. Logical deduction may be content with the statement of particulars which were already enfolded in the corresponding induction. But this use of deduction gets us nowhere. It is merely going in a circle. It was this fatal limitation which reduced to mere barren routine the scholasticism that preceded the Renaissance. The discovery or recognition of scientific induction, which, from the beginning, man had used unconsciously and therefore only to a very limited extent, was the first ray of light to penetrate the darkness in which men were then groping. Even yet, human progress is greatly impeded by the failure of the majority of our fellows to recognize clearly, and to use consciously and intelligently, a mental process which they unconsciously and gropingly use every day of their lives.

Careful, analytical thought will show that most of the recognized facts of experience are really conclusions

reached by induction. The mind becomes stocked with many of these in youth and is unaware in many cases of why or when they are accepted. The education of youth has consisted to a far too great extent in this "stocking" process, to the too frequent neglect of insight into how the conclusions were reached. Every teacher of science to beginners knows that the transition from this ordinary stock of knowledge to a conscious, critical extension of experience, with the ordinary student, is very gradual. The growth of science results from a conscious, systebatic, critical continuation or extension of intelligent experience, by the use of the twin rational processes, induction and deduction.

Scientific use of deduction, depending, as has been said, on discernment of wider application of principle, is progressive, constructive, aggressive; it stimulates growth of related, vital knowledge. Scientific use of induction and deduction, as contrasted with mere logical use of these processes, is largely dependent on insight. The author of the article alluded to is qiute right in speaking of "vision" (or insight) as characterizing the men who make use of scientific induction. But the "vision" in each case is neither less nor more than the natural result of discernment of the essential principle. He who does not, or cannot, discern the underlying principle in any given scientific induction or deduction must be denied the "vision."

It was thus through insight or "vision" that Dr. Miller, in the early days of Cobalt, by induction formulated the relationship of the silver ore deposits to the diabase sill. It was by similar "vision" and deduction that Dr. Bell made his startling discovery of the spectacular silver-bearing veins in Keeley Mine in South Lorrain, fifteen or twenty miles from Cobalt, where others, perhaps lacking Dr. Bell's "vision," had failed.

In a similarly striking example of insight into essential principle, by use of induction, our brilliant young geologists have quickly unravelled and stated the genetic relationship of the auriferous ore bodies at Porcupine and Kirkland Lake to their associated formations. Similarly, "vision" and deduction led to prediction of probable discoveries in like formations, probably the extension of these, in western Quebec—a prediction which, from reported recent discoveries in that area, appears to be well-founded.

Scientific use of induction, again, must receive credit for stating the relationship of Sudbury copper-nickel orebodies to the associated norite batholith. So also must scientific use of deduction be credited with the discovery of a large body of ore under 80 feet of muskeg in Levack township after several previous attempts by diamond-drilling had failed to find it; likewise with the discovery of ore under 100 to 200 feet of gravel east of Garson Mine.

A further example is the prediction made some years ago by Prof. Mickle, Mines' Assessor of Ontario, regarding the silver-bearing veins at Cobalt. The application of the principle or law of averages to such a case as this was very unusual, being less obvious than the illustrations already given. His general statement led to a prediction by him, based on deduction therefrom, which proved to be remarkably sound. The prediction was very startling and was probably received with many grains of doubt by mining engineers. Many of us at the time were denied the "vision," because we had not the insight to discern that this law or principle was applicable to this particular case.

For the mining engineer, who hopes to see farther than mere calculation of ore blocked out or indicated by drilling; who realizes that the future of the mining industry rests more on discovery than on any other single factor; and who knows that discovery seldom results from mere blind searching; the companion processes of reasoning—induction and deduction—are the most powerful aids he can invoke. As well may the shoemaker despise his last as the mining engineer disdain to use these most potent twin tools of the intellect.

These rational processes culminate in the law of the uniformity of nature—a sweeping induction that is lifting man out of the mire of superstition. But for this fundamental induction, on which every other scientific conclusion is founded, we would all still be trying to propitate the spirits, supposed by primitive peoples to control the many natural phenomena reacting on us. To these two rational processes we must attribute such progress as man has made in unravelling nature's secrets and in bringing her forces into subservience. To these we must also look, as the most efficient tools yet discovered for carving out his future destiny, by enabling him to continue his progress in understanding her laws, in controlling her forces, and in co-ordinating his own activities with hers.

C. V. CORLESS

Coniston, Ontario, September 14th, 1923.

POSITION OPEN IN DEPARTMENT OF MINES.

The Civil Service Commission, Ottawa, announce that applications will be received up to October 11 th for the following position:

6058—An Editor, Grade II (Male), for the Administrative Branch of the Department of Mines at Ottawa, at an initial salary of $2,400 per annum.

Duties.—Under direction to edit reports bulletins and other publications of the Department of Mines; to correct errors in text as well as in grammer and punctuation and on occasion to alter or rewhite reports; to confer with authors of reports; to supervise proof-reading; to specify make-up and other technical details; to be responsible for the preparation of tables of contents and indexes; to supervise subordinates; and to perform other related work as required.

Qualifications required.—Education equivalent t graduation from a University of recognized standing; a good working knowledge of the general outlines of applied geology and mining engineering, and of the technology of one or more of the following:—ore dressing, metallurgy, fuel testing and ceramics; a thorough command of English; ability to write technical papers, and to edit and to prepare for publication, scientific reports; discretion, tact and good judgment

This position will be filled temporarily at present, but should a permanent appointment later be required, the temporary incumbent may be certified in the position providing his services have proved satisfactory to the Department while temporarily employed. In the case of a permanent employee, the initial salary of $2,400 will be increased upon recommendation for efficient service at the rate of $120 per annum until a maximum of $2,880 has been reached.

Preparations are being made in the Norwegian Mint for the striking of a new coinage which will only be valid as currency in Norwegian territory. The coins will be of nickel, and will probably have a hole through the middle.

In the United States alone, one hundred million dollars worth of copper is refined by electricity as a result of the genius and research of Davy and Faraday

McIntyre Porcupine Mines and Management

By ALEXANDER GRAY

The Eleventh Annual Report of McIntyre Porcupine Mines is a compliment to the men who made it possible. No matter what the actuaries may think or say about mines with gross ore reserves of $8,514,800 and a market capitalization of $12,800,000, they concede to the management all it is entitled to for having brought the properties and plant to their present status. The McIntyre directorate will be accorded all due credit for having sustained General Manager Ennis, the proof of progress being exhibited in the mining position, the enlarged milling plant, the treasury, the general outlook—even the Blue Diamond coal venture that is involved in the further purchase of the Canadian Coalfields, Limited.

By themselves, Porcupine Mines of the McIntyre company are an outstanding example of what can be achieved in spite of recurring handicaps. With current assets approximating $1,000,000, liquid reserves amounting to $1,558,199.84, investments of $619,494.23, and the gross values of the ore reserves conservatively estimated at $8,514,800, speculative factors are provided for those who are not in a hurry. Undoubtedly the coal properties are a slow asset, and the $1,000,000 commitment against the property of Canadian Coalfields is not to be evaded unless McIntyre Directors find it possible to create a subsidiary organization to deal with the Blue Diamond as well as Canadian Coalfields.

Encouragement and Difficulties

Otherwise the McIntyre gold areas have the elements of prosperity succinctly pointed out by President Bickell. "The lower horizons have only been explored to a very limited extent, due to the re-occurrence for the third successive season of an acute hydro-electric power shortage which greatly curtailed our development programme and production. In view of such a serious handicap, the fact that our ore reserves have been increased in excess of a million dollars is worthy of note." "The mill is presently treating an average of 1,000 tons daily, and we have every reason to expect that the present year will prove to be the most prosperous in the Company's history."

How grievous were the power difficulties, is set forth by General Manager Ennis. "The new mill addition," he writes, "was ready to operate on November 1st but, due to a shortage of hydro-electric power, only 50 per cent of it was put into commission. There were further reductions in power, with consequent reductions in tons milled, until in April only 250 tons per day were being treated. Full power was available again on May 3rd, and in that month 28,085 tons, and in June 27,925 tons were handled."

Shortage of hydro-electric power, generation of steam power, minimized operations, automatically precluded the reduction of working costs and prevented the management from doing all it wished to do in the matter of development. Notwithstanding this, after treating 240,615 tons, averaging $9.96, having a gross value of $2,397,303, of which $2,249,741.63, $9.35 per ton or nearly 94 per cent., was recovered, the ore reserves, as President Bickell emphasizes, were increased more than a million dollars in value, and the broken ore in the stopes at the end of the year amounted to 155,881 tons, compared with 130,136. Taking this into consideration along with the 27,000 feet and more of development and exploration work, the operating cost of $5.54 per ton milled is a mark of efficiency.

Deep Level Mining

The present and immediate future of McIntyre Mines rests securely as to continuous and increasing production, in the area between the 1,000 and 2,500-ft. levels. What there is or may be at greater depth is only a subject for conjecture. The 242,891 tons milled in the year ended June 30, came from the section between the 1,000 and 2,125-ft. levels. "What work has been done," writes Mr. Ennis, of the lowest levels, has indicated "no change in the favourable geological conditions." The certainties, without indulging in projections, lead Mr. Ennis to abide by his judgment that the present lower levels "should add materially to the ore reserves of the mine in vein systems Nos. 7, 9, and 10, with the possibility of other vein systems being found."

McIntyre's record for the year was the best of the eleven years since milling began. The gross value of its production was $2,397,303. The average value of the ore milled was somewhat lower than it was since 1919. Mr. Ennis aims at uniformity over the years and his confidence in the properties is manifest. To the end of the eleventh milling year, $16,089,020.20 was produced and $15,222,411.09 recovered, the average of 1,586,736 tons treated being $10.14, of which $9.59 was recovered. The average of the further 858,504 tons in the estimated ore reserves is $9.92. Obviously the record to date "is a reasonable check" on what Mr. Ennis is assured of in the section below the 1,000 foot level. He gives chapter and verse for what he has, making allowances for dilutions. The case for the McIntyre is clearly stated by him, in this way:

No. 5 Vein:—

The stopes in No. 5 Vein on the 1,250 and 1,375 produced 66,902 tons of ore of $11.00 grade. Stoping operations are being carried out on the 1,500 in this vein but no development has been done below this level. From stopes in North No. 5 Vein System there have been drawn 43,523 tons of $10.30 ore. These ore bodies are irregular, the stopes ranging in width from 8 feet to 40 feet and usually of high grade ore. On the 1,250, 1,375 and 1,500 levels No. 2 lense of this system was opened up in length varying from 105 to 300 feet in ore 10 feet wide, averaging $10.50. On the 1,375 and 1,500 No. 3 lense 35 feet north of No. 2 has been opened up a distance of 150 feet in ore of $16.00 grade. No. 4 lense 75 feet north of No. 3 was opened up on the 1,375 and 1,500 a distance of 164 feet, 15 feet wide of $25.00 ore. These ore bodies are lenses of disseminated pyrite in basic schist adjacent to tongues which extend upward from an underlying body of porphyry. These porphyry tongues rake to the east from 40 to 50 degrees and the adjacent schist offers favourable areas for the occurrence of similar ore bodies.

No. 6 Vein:—

No. 5 Shaft passed through No. 6 Vein at 2,125 and 108 feet of drifting shows ore of $11.00 grade. This vein lies south of a porphyry tongue and has all the characteristics of the North No. 5 Vein.

No. 7 Vein:—

This vein consists of closely paralleling lenses which must be mined as one continuous ore body with consequent dilution. On the 1,500 foot level 573 feet of advance was made in ore 5 feet wide assaying $8.00 per ton. On the

1 625 foot level, 695 feet of advance was made in ore 5 feet wide assaying $8.50 per ton. On the 1,725 foot level 952 feet of advance was made in ore 9 feet wide assaying $8.50. On the 1,875 level 980 feet of advance was made in ore 7 feet wide assaying $8.00. On this level No. 7 Vein is opened up for a distance of 1,500 feet in ore averaging 10 feet wide with an average value of $10.60 per ton. No drifting has been done on No. 7 Veins below the 1,875 foot level.

No. 8 Vein:—

No. 8 Vein mentioned in last year's report has not been found below the 1,500 foot level and being of low grade on the 1,375 and 1,500 foot levels no work has been done on it.

No. 9 Vein:—

No. 9 Vein has been opened up on the 1,875 foot level for a distance of 479 feet, showing ore of an average value of $10.20 per ton over a width of 9 feet. At 580 feet south of No. 5 Shaft No. 9 Vein is exposed on the 2,125 foot level, assaying $21.80 over 8 feet. 60 feet of drifting has been done, averaging $25.40 over a width of 8 feet. Crosscuts are now being driven south from No. 5 Shaft on the 2,000, 2,250 and 2,375 foot levels to intersect this vein.

No. 10 Vein:—

Crosscuts from the lower levels have not advanced far enough south to intersect No. 10 Vein. Diamond drill hole No. 359 passed through this vein on 1,875 horizon showing 10 feet of ore assaying $9.60.

HOW TO DESTROY DAMAGED EXPLOSIVES

BY J. H. HORLICK, Jr., in *Explosives Engineer*

It is sometimes necessary to destroy explosives that have deteriorated until they are no longer useful or that have become dangerous because of leaking ingredients. The only sure methods of destroying these explosives are to burn or to explode them. However, exploding is not practicable because of the violent disturbances produced by detonation in the open. Burning, therefore, is the safest and most effective method.

When destroying high explosives they are first taken to a safe place and the cartridges removed from the cases. The best practice is to remove the explosives from the wrapper, or slit and spread the cartridges apart. The explosives are then spread in a thin layer on straw, paper, excelsior, or other inflammable material. If the wrappers are removed they should be spread out and burned on the same pile. A deep layer of explosives is dangerous, because when the material on top or on the edges starts to burn there may be sufficient confinement to cause the underlying material to explode instead of burn. Some high explosives are so difficult to ignite that it is necessary to moisten them with kerosene before lighting; in fact, the use of kerosene is advisable in every instance, because when sufficiently saturated with kerosene there is virtually no probability of explosion. Under no circumstances should the operator remain near enough to be in danger if an explosion should occur.

One way of igniting the explosives is to lay a trail of paper or excelsior which, when lighted, acts as a fuse and allows the operator to gain a safe distance before the flame reaches the powder. If blasting powder is at hand, a more positive method of ignition is to insert a fuse or an electric squib in a short train of blasting powder in contact with the thin layer of explosives. After the blasting powder is ignited by the fuse, or electric squib, it quickly causes the other explosives to burn.

In destroying large quantities where repeated burnings are necessary, explosives should not be poured or placed on the same ground that has been used for a previous lot, because there may be sufficient heat remaining to ignite them. The empty cases should also be burned. If they show signs of having been in contact with leaking ingredients, the boards should be piled in a long low heap, in order to reduce to a minimum the possibility of an explosion. The safest practice is to do this, even if stains are not visible.

Under no circumstances should the attempt be made to destroy high explosives by placing them in water, because nitroglycerin and some other explosive ingredients are not soluble in water, and are, therefore, not destroyed by immersion.

Black blasting powder may be destroyed by burning in a similar manner to that described for high explosives; the same precaution of avoiding a deep layer of powder should be observed. The powder may be ignited either by a trail of paper, a fuse, or an electric squib. Blasting powder can be made non-explosive by immersing in water if it is permitted to remain long enough for the soluble ingredients to dissolve. A fairly large body of water should be used for this method.

When properly stored, blasting caps seldom deteriorate sufficiently to be unfit for use. The usual cause for deterioration of standard blasting caps is excessive moisture. The chief danger in destroying them is from pieces of the copper capsules flying through the air; the sharp flying fragments readily imbed themselves in the flesh. A convenient method which avoids this danger is to place the caps in a hole with a primed dynamite cartridge, and cover them well, preferably with sand. Detonation may be accomplished by means of a good cap and fuse, or an electric blasting cap. Before being destroyed, electric blasting caps should have their wires cut off an inch or two from the capsules, because the wires are likely to cushion the shock and prevent the explosion of all the caps. The deterioration of the caps is no excuse for carelessness; they should be handled even more carefully than caps in good condition.

GUANO STILL IN USE

In spite of the competition from rock phosphate, the guano of the islands of the coast of Peru that used to be such an important source of phosphate fertilizer is still used. It is now gathered as a crop, being obtained from the islands successively while it is allowed to accumulate on the others.

CARBON BLACK IN THE UNITED STATES

The output of carbon black in the United States in 1922 was almost 60,000,000 pounds, worth $5,500,000, or an average of about 9.1 cents per pound. A large part of this was used as a filler for rubber tires.

OIL FROM LIGNITE IN GERMANY

Germany's production of oil from the distillation of brown coal and lignite is growing by leaps and bounds. Low-temperature carbonization, followed by briquetting, is being practised successfully in several new plants of large capacity. It is predicted that Germany will, in the not far distant future, produce by this means all the mineral oil she requires.

The same raw material — lignite beds at or near the surface, amenable to mining by steam shovel—is available in abundance on the Canadian prairies.

Ontario's Mineral Production

First Six Months of 1923.

Last week the report of the Ontario Department of Mines on the Province's mineral production for the year up to June 30th was made public, as follows:

SUMMARY OF ONTARIO'S MINERAL PRODUCTION — FIRST HALF OF 1923.

(Comparative figures are given for the corresponding period in 1922. Tons throughout are short tons of 2,000 pounds.)

PRODUCT		Quantity (6 mos.) 1922	Quantity (6 mos.) 1923	Value $ (6 mos.) 1922	Value $ (6 mos.) 1923
METALLIC					
Gold	ounces	476,338	418,497	9,845,910	8,648,938
Silver	"	4,774,666	4,938,364	3,273,247	3,280,209
Platinum metals	"	151	85	9,421	7,108
Copper sulphate	lbs.	22,553	.....	1,310	.....
Copper metallic	"	495,899	6,083,601	57,603	967,054
Copper in matte*	tons	505	2,835	101,000	567,005
Nickel in matte*	"	425	4,594	212,500	2,296,818
Iron ore (&)	"	1,004	6,486	14,472	22,579
Iron, Pig (&&)	"	10,517	6,537	258,953	176,499
Iron Arsenate	lbs.	75,000	.....	938	.....
Cobalt, Metallic	"	2,411	139,746	7,246	374,425
Cobalt oxide	"	153,510	242,604	315,284	475,681
Nickel oxide	"	437,258	4,607,827	75,002	854,596
Nickel-Cobalt oxides ** (unseparated	lbs.	647,254	265,379	131,525	152,852
Nickel, metallic	"	102,200	10,308,418	29,466	1,986,421
Nickel Sulphate	"	27,270	.....	2,231	.....
Lead, pig	lbs.	11,993,880	1,784,749	112,604	120,694
TOTAL METALLIC		.....	.....	14,448,312	19,930,696
NON-METALLIC					
Apatite	tons	31	.....	248	.....
Actinolite	"	.....	55	.....	605
Arsenic	lbs.	2,438,731	2,387,168	163,318	288,586
Feldspar	tons	5,676	7,446	45,206	40,811
Fluorspar	"	123	61	1,486	531
Graphite	"	330	545	17,032	31,588
Gypsum	"	44,932	47,948	260,670	219,656
Iron Pyrites	"	5,846	6,538	20,486	24,047
Mica	"	215	721	17,076	27,661
Mineral Water		.....	.....	2,965	2,500
Natural Gas	M. cu. ft.	3,863,000	4,388,000	1,638,400	2,457,280
Peat	tons	1,860	.....	9,300	.....
Petroleum	bbls	76,003	78,299	218,888	216,015
Quartz	tons	6,957	41,275	9,843	94,008
Salt	"	57,573	96,207	926,938	854,119
Talc	"	9,967	4,535	86,472	58,550
TOTAL NON-METALLIC		.....	.....	3,418,327	4,316,047
STRUCTURAL MATERIALS and CLAY PRODUCTS		.....	.....	9,739,000	10,966,000
GRAND TOTAL		.....	.....	27,605,639	35,212,746

* Copper and nickel exported in the form of matte valued at 10 and 25 cents per pound, respectively.
& Iron ore figures in the table include only exported product or shipments to points other than Ontario blast furnaces.
&& Figures in the table represent proportional output and value of pig iron produced from Ontario iron ore.
** Includes residues marketed.

General Remarks

Returns received by the Ontario Department of Mines from the mines, smelters and refining works of the Province for the six months ending June 30th, 1923, are tabulated in the preceding table. Compared with the figures for the corresponding period in 1922, the total production shows an increase of 27.6 per cent. The outstanding feature is the marked increase in production of nickel and copper. Nickel-copper mines, smelters and refineries of the three companies are all in operation again, indicating a revival in business following the stagnant period succeeding the Great War. The total metallic production shows an increase of 37.9 per cent.

Non-metallic minerals show an increase in output of 20.8 per cent, increases being noted in feldspar, graphite, gypsum, iron pyrites, mica, natural gas and petroleum, quartz and salt.

Gold

The small decline in gold production was due to an acute shortage of hydro-electric power during the first four months of the year. This situation has been remedied by the completion of additional power plants on the Mattagami and Montreal Rivers, while other hydro-electric plants to serve Ontario's gold mines are now under construction on the Quinze and Abitibi Rivers. With ample power available, increased milling capacity at both Porcupine and Kirkland Lake and the addition of new producers, it is expected that production of gold in Ontario for the full year 1923 will be considerably in excess of the 1922 output of one million

ounces. In addition to the values given in the table, mines reported receiving for bullion marketed the sum of $60,269 by way of exchange premium which averaged 1¾ per cent. for the half year.

GOLD PRODUCTION — FIRST HALF OF 1923

Source	Ore Milled	Bullion Shipped Gold	Silver	Total Value
	Tons	Ounces		
PORCUPINE				
Clifton-Porcupine	920	122	37	2,544
Dome	166,900	94,744	14,994	1,968,774
Hollinger Consol'd	603,657	205,787	34,136	4,276,249
McIntyre	110,068	47,793	16,277	996,514
Total	881,545	348,446	65,444	7,244,081
KIRKLAND LAKE				
Kirkland Lake Proprietary (1919)	1,803	580	294	12,174
Kirkland Lake	28,638	7,227	984	150,041
Lake Shore	11,457	14,431	1,040	299,003
Teck-Hughes	18,611	27,018	1,869	560,445
Wright-Hargreaves	38,724	20,405	2,328	381,210
Total	99,233	69,691	6,515	1,402,873
Miscellaneous	.....	13	4	270
Nickel-Copper Refining	.....	347	.....	6,949
Grand Total	980,778	418,497	71,963	8,652,173

Silver

Shipments from the mines at Cobalt and outlying silver areas show an increase as compared with 1922, the figures being 4,938,364 and 4,774,666 ounces, respectively. South Lorrain, about 18 miles south-east of Cobalt, has attracted much attention owing to the richness of the ore being mined by the Keeley and Lorrain Operating (Mining Corporation of Canada) companies, the combined output being 1,283,026 ounces of silver. In addition the South Lorrain ore carries a high cobalt content. The success being experienced in this area has stimulated prospecting throughout Ontario's silver producing areas.

The average New York price of silver for the half year was 66.05 cents per fine ounce compared with 67.34 cents in 1922. Shipments of silver ore and concentrates over the T. & N. O. Railway were 641 tons to points in the United States, and 1,041 tons to the Ontario silver smelter at Deloro. Shipments of silver by the largest producers are given in order: Nipissing,1,620,546 ounces; Keeley, 826,814; Coniagas, 711,617; O'Brien, 488,571 Lorrain Operating Co. 456,212; Mining Corporation, 409,994. A summary of shipments is given hereunder:

	Ounces	Value $
Cobalt, South Lorrain and Gowganda	4,843,316	3,217,569
Contained in gold bullion	71,963	47,496
Recovery from Nickel-Copper refining	23,085	15,144
Total	4,938,364	3,280,209

Refineries.—Two refineries in Southern Ontario treat silver ore and recover silver, cobalt, nickel, arsenic and copper. A total of 4,521 tons of ore, concentrates and residues were treated during the six months. The Coniagas Reduction Company has operated the plant of Coniagas Alkali and Reduction Company since Feb. 20th, when the latter company ceased work. Metallic nickel and oxide recovered is small compared with the output of nickel-copper refineries, shipments being 32,855 lbs. of nickel and 11,468 lbs. of oxide, in addition to unseparated cobalt-nickel oxide. Residues are valuable chiefly for their cobalt content. White arsenic, cobalt and cobalt oxide shipments are noted in the tabl The Deloro Smelting and Refining Company at Deloro operates an insecticide plant.

Nickel and Copper

Production from the Sudbury area shows a mark increase over the 1922 output, indicating a recovery from the over-stocked nickel market following the Great War. The Mond Nickel Company operates a plant at Clearfield, Pa., for the production of malleable nickel and the International Nickel Company has erected at Huntington, W. Va. a rolling mill for production of nickel and monel metal products. Monel metal — an alloy of nickel and copper in the proportions found in the matte turned out by the Sudbury smelter — is finding wide use for a great variety of purposes. After a prolonged shut-down the mine, smelter and refinery of the British America Nickel Corporation resumed operations during the second quarter of 1923.

During the period 457,269 tons of ore were smelted by the three companies for an output of 25,238 tons of nickel-copper matte containing 26,885,458 lbs. of nickel and 13,574,235 lbs. of copper. Exports of matte were 9,142 tons of which 4,196 tons were shipped by the International Company to Huntington, W. Va., and 4,946 tons by the Mond Company to Wales. The two Canadian refineries treated 15,145 tons of matte, recovering therefrom 10,275,563 lbs. of nickel, 4,596,359 lbs. of nickel oxide and 6,053,419 lbs. of copper in addition to gold, silver, platinum and palladium noted under their respective headings or in the table on page 765.

Iron Ore and Pig Iron

During the half year 2,508 short tons of briquettes, beneficiated magnetite, from Moose Mountain were shipped to the Steel Company of Canada, and 6,486 tons to points other than Ontario blast furnaces, the total value being $32,429. The Iron Ore Committee appointed by the Provincial Government to investigate the possibilities of a wider use of Ontario's low grade iron ores has submitted its report which will be printed in the near future.

In January only three blast furnaces in Ontario were in operation. The number was increased to six for May and June. The Algoma Steel Corporation at Sault Ste. Marie and the Steel Company of Canada at Hamilton charged to blast furnaces 11,138 short tons of domestic ore and 555,166 tons of "Lake" ore, or a total of 566,304 tons, less than 2 per cent being Ontario iron ore. Pig iron production was 296,739 long tons divided as follows: basic 166,224; foundry 87,697; and malleable 42,818 long tons; the total valuation at $29.70 per long ton being $8,813,148.

Ferro-silicon was produced by the Electro-Metallurgical Company of Canada, formerly Electro-Metals of Welland, and also as a by-product by three companies in the Niagara peninsula who manufacture artificial abrasives, the total output being 13,013 long tons.

Lead

Ontario's only operating lead mine and smelter are situated at Galetta on the Ottawa River and are operated by the Kingdon Mining, Smelting and Manufacturing Company. A blast furnace has been installed to treat slag and flue dust. A small recovery of lead is made from Cobalt silver ores and concentrates shipped to United States refineries for treatment, and returns for this recovery are received annually. The average New York price for the half year was 7.75 cents per pound. Total Ontario shipments were 1,784,749 pounds valued at $120,694.

Non-Metallic Minerals

As noted under heading "General Remarks" the total increase over 1922 in valuation of non-metallic minerals shipped was 20.8 per cent. Although no apatite shipments are reported there is a good local market at Trenton, where the Chemical Products Company manufacture sulphuric acid and acid phosphate.

Arsenic sales were not as large as in 1922 but the average price increased from 8½ cents per pound for the full year of 1922 to 12½ cents for the first half of 1923.

Figures of feldspar production are incomplete. There are two grinding plants operating in the Province. The bulk of the production, however, is exported in crude form. Feldspar fines are used as a pebble dash for stucco.

Gypsum shipments were as follows: crushed and ground, 27,407 tons; calcined, 1,174 tons; calcined gypsum used in gypsum products such as plaster board, blocks and alabastine, 19,367 tons. Mines and mills are located at Caledonia and Lythmore in Haldimand county.

The increased tonnage in mica shipments is due to scrap mica, now used largely for the manufacture of ground mica which has a great variety of uses such as covering ready roofing, as a powder for applying to automobile tires, in lubricants and in the electrical industry for insulating purposes.

Natural gas production shows a small increase in quantity over 1922 figures and a larger increase in value which has been placed at 56 cents per M. cubic feet. The drilling of new wells, prevention of leaks, and general methods of conservation explain the present situation as regards natural gas.

Petroleum shows a small increase in output but the average price was $2.76, as compared with $2.88 during the corresponding period of the previous year. The price rose from $2.38 at the beginning of the year to $2.98 on Feb. 20th and declined by 10 cent drops to $2.48 on June 29th. The valuation in the table does not include the bounty of 52½ cents per barrel paid by the Federal Government amounting to $41,107.

Quartz production shows an increase, reflecting greater activity in steel making, ferro-silicon production and the nickel-copper industry which absorb the bulk of the output.

Salt sales of 96,207 tons includes the salt equivalent (39,217 tons) of brine used in chemical works. The grades of salt marketed were as follows: table and dairy, 20,487 tons; fine, 17,825; coarse, 15,251; land, 2,030 and pressed blocks of domestic manufacture, 1,397 tons.

Talc production showed a marked decline as compared with 1922 although a larger percentage of the finer and more valuable grades were marketed. The main output comes from Madoc.

Structural Materials and Clay Products

The itemized list includes Portland cement, brick, tile, pottery and sewer pipe, lime, sand and gravel, sand-lime, brick and stone. No statistics were obtained from producers, the estimated value being based on the relative building activity as deduced from Ontario building contracts awarded. McLean Building Reports show Ontario contracts totalling $84,020,000. for the first half of 1923 as compared with $74,586,900 for the corresponding half of 1922, an increase of 12.6 per cent. The City of Toronto accounted for $18,049,732 outstripping all previous records, and the Province as a whole is credited with over 50 per cent. of the entire Canadian contracts awarded. Building permits in 35 Ontario centers as reported to the Dominion Bureau of Statistics were $37,754,678 for 1923 and $36,213,035 for the first half of 1922 or an increase of 4¼ per cent. Prices of building materials stiffened as spring advanced, but receded somewhat in June. Mortgage money and building funds appeared to be ample for all construction requirements.

RESEARCH MAKES MONEY

A successful and highly remunerative series of researches is described briefly in a recent issue of *Chemical and Metallurgical Engineering*, thus:

Why do clear-thinking, well-informed business men who hold the stock or compose the directorates of companies in our chemical engineering industries so frequently disparage a policy of research? An old riddle which is growing more perplexing as it ages! To regard a technical staff as a semi-liability at best, to dispense with it whenever storm clouds gather on the business horizon—such is altogether too frequently the creed of those who pass upon expenditures. No more clear-cut evidence of such folly, or rather the wisdom of the maintenance of research, has come to our attention recently than the remarkable story of achievement made by one of the great yeast companies. This story is at once an inspiration to the research worker and a rebuke to those whose first thought is to reduce the technical staff in time of financial difficulty.

A few years ago yeast was made by this particular company from a cereal mash on an enormous scale and in eleven plants. About one-quarter of the grain was converted to yeast; from the mash alcoholic beverages and allied products were produced which yielded sufficient revenue to make possible a very low margin of profit on the yeast. Then came our entrance into the war. Edible cereals could no longer be used. Research found a manner of using oats as a substitute. Labor cost rose as high as 260 per cent above the pre-war level. As an offset to this, research developed a process to increase the yield to a figure previously unheard of.

Then prohibition came, seemingly to cap the climax. Competition with industrial alcohol makers could not be met with the costly high-grade grain alcohol produced by this process. Yet without this market the cost of yeast must be substantially increased. Again after a real struggle on the part of the research staff in a comparatively unknown and poorly charted field of chemistry the answer was found—production from new materials with the evolution of no alcohol and of almost no other side products. The net result of its research, which was well paid for, enabled this company to maintain its retail prices at pre-war standards through years of rapidly shifting economic conditions. Its process reached an efficiency of practically 100 per cent conversion of raw materials to yeast. Its product was improved, its sales were increased, its research facilities developed to the highest point. And all this through a period when many firms were endeavoring to weather the storm by putting a sign over the laboratory door, "This Way Out."

We have cited other similar instances; we shall cite more. Research, despite the many kicks it has had, is alive and growing. Here is added justification for our contention that it is indispensable in trying as well as in prosperous periods. Properly directed, there is no better manner of insuring increased dividends.

THE MINING DISTRICTS

By THE JOURNAL'S CORRESPONDENTS

NORTHERN ONTARIO

Argonaut — During the last few months there has been a certain amount of doubt expressed as to the results being obtained by the Argonaut Mine in Larder Lake. According to recent public announcements, however, the company appears to have solved its metallurgical problems. The ore contains a considerable amount of copper. Oil flotation was tried, but at first succeeded in obtaining only a comparatively low-grade concentrate. Recent work, however, has resulted in copper concentrate of about 20 per cent., carrying a considerable amount of gold, and this makes a satisfactory shipping product. The recovery is stated to be approximately $11.00 a ton from a $12.00 ore. The mill is at present treating approximately 60 tons a day, although it has a rated capacity of about 200 tons a day. A new compressor is being added to the mine equipment, which will permit the company to carry on more underground work.

Kirkland — A special general meeting of the shareholders of the Tough-Oakes Gold Mines, Limited, was held in Toronto on September 12th. This meeting was called for the purpose of ratifying several by-laws that had been passed by the Directors. The most important of the by-laws is one providing for the changing of the company's name to the Tough-Oakes-Burnside Gold Mines, Limited, and increasing the capital from $3,000,000 to $5,000,000, the shares having a par value of $1.00 each, instead of $5.00. The directors are authorized to sell the unissued capital stock after the increase has gone into effect, at a discount of not more than 55 cents a share. Another by-law provides for the purchase of five claims in the Kirkland district. The Tough-Oakes and Burnside properties are controlled by the Kirkland Lake Proprietary of London, and this new amalgamation will consolidate the company's interests in the Kirkland district. Recent work on the 800-foot level from the Tough-Oakes shaft is reported to be satisfactory.

Among the cases to be heard before the Mining Commissioner in Kirkland Lake on September 18th is a dispute between the Teck-Hughes and the Kirkland Gold regarding the disposal of the latter company's tailings. Earlier in the year the Commissioner gave permission to the Kirkland Gold respecting the temporary deposit, but the Teck-Hughes claims that its rights are being infringed and asks for an order restraining the Kirkland Gold from depositing tailings on the Teck-Hughes ground and compensation for damages that the company has suffered. During the month of August the Teck-Hughes produced $89,131, as against $80,500 in July.

It is announced that the capital of the Hunton-Kirkland Gold Mines Limited, has been increased from $2,000,000 to $4,000,000. Cross-cutting is being carried on at the 375-foot level in an effort to locate the faulted extension of the vein which showed some ore on the surface.

The Lebel-Lode announces the offering of 100,000 shares of treasury stock by public tender. The company's property consists of 173 acres adjoining that of the Continental Mines, and it is hoped to obtain sufficient money to carry on an extensive development campaign. The capitalization of the company is 2,000,000 shares, of which only 659,000 have been issued.

Diamond drilling will be started on the Sylvanite property, in an effort to locate the faulted extension of the main vein. An ore-shoot 200 feet long has been developed but is faulted at both ends.

South Lorrain — During the month of July the Lorrain Operating Company produced 130,120 ounces of silver. This company is owned by the Mining Corporation, which holds the South Lorrain properties. It is expected that the new 550-foot shaft will be in operation in about two weeks. The Mining Corporation has completed preparations for its work in Gillies Limit. A certain amount of surface work has been done, but it is understood that a shaft will be started at once.

Cobalt — The McKinley-Darragh has sunk a shaft 30 feet deep on the Paul claims in the Gillies Limit, but it is understood that the results are not as satisfactory as surface showings indicated.

During the month of August the Nipissing mined ore of an estimated net value of $173,459 and shipped bullion of an estimated net value of $284,696. The value of the month's production was estimated at 63⅛ cents per ounce. The low-grade mill treated 7,153 tons and the high-grade plant 70 tons. The refinery shipped 451,595 fine ounces of bullion. There were no new developments of importance underground but stoping operations at the different shafts continued to be satisfactory.

Faulty Statistics — According to the report of the Ontario Bureau of Mines, shipments of silver during the first six months of the year amounted to 4,938,364 ounces, an increase of 160,000 ounces as compared with the corresponding period of the previous year. The shipments of silver by the different companies are all given, but this means very little, and in order to give an accurate idea of what is being done, the Government should show figures for production. The Nipissing and Mining Corporation both buy high-grade ore, and the Mining Corporation also purchases low-grade ores. The production of these ores is all credited to the company that makes the shipments, so that due credit is witheld from the actual producer.

Higher Wages — The International Nickel Company at Sudbury announces an increase in wages effective October 1st. Machine men have been raised from $4.25 to $4.75 a day, and this new rate will compare with $4.50 being paid in Cobalt and $4.80 in Porcupine. It is generally conceded that there should be a difference in the rate paid in Porcupine and Sudbury, and it is a question if the Porcupine operators will consider that the new rate established by the Nickel Company will not necessitate another raise in the gold camp. Cobalt operators, unlike the others, cannot afford to raise wages beyond the present level, and it may result in their losing a number of good men. It is unfortunate that this act on should have been taken

at present, because an increase of this sort does not effect the operating companies so much as it does those companies that are carrying on development work on new properties. Any increase in wages for this sort of work is an extremely important factor, and is often the determining point as to whether work will be carried on or not. It is understood that the Nickel Company is not short of men at present, but it desires to keep the men it has and to bring back a number of men who were forced to leave the district during the prolonged shut-down.

BRITISH COLUMBIA

Dease Lake Placers — The persistent efforts of operators in the Dease Lake Country to develop the hydraulic placer properties on McDame and Thibert Creeks, are receiving recognition from the Provincial Government. The old Cassiar trail, which was not in shape to permit of the haulage of any heavy plant or machinery for the last 50 miles from the Tooya River to Dease Lake, is being converted into a wagon road for the entire distance of 72 miles from Telegraph Creek, and a renewal of activity in these old-time camps is to be looked for.

Already, machinery is being taken in and there is a prospect that during the next season the value of the ground may be fully demonstrated by provision of the necessary water supply for hydraulic mining on a larger scale than has been yet possible.

By reason of these improved conditions, it is reported that George Adams has been enabled to interest capital in his praise-worthy enterprise on Thibert Creek upon which he has been working steadily for some years.

Bog Iron Ore at Alta Lake — Dr. Davidson and associates, of Vancouver, report that the market for the product of their bog iron deposits situated close to Alta Lake on the Pacific Great Eastern Railway is improving. Shipments are being made regularly to the gas works of Seattle and Tacoma for use in the purification of gas. They state that their iron ore has been found more satisfactory than material obtainable elsewhere and the prospect of the development of an important industry along these lines is bright. It is their hope, of course, that some definite action will be taken to establish an iron and steel industry, in which event, they believe, their iron deposits, because of their proximity to the railway and economy of extraction, would become of importance.

The principal deposit of this limonite ore occurs about half a mile west from the north end of Alta Lake and outcrops on the westerly edge of a large swamp at the foot of a thickly wooded hillside. Here several outcroppings occur within an area of about 450 feet in length and about 250 feet in width. The extent of the deposits has not been fully determined but the ore is exposed in several open-cuts. On the surface the ore usually is loose and earthy, but a few feet below it becomes more compact. To the west the mountain rises abruptly to a considerable height. The rock formation is schistose in structure and carries a high percentage of iron pyrites, from the oxidation of which the limonite apparently derives its origin.

A steam shovel and other equipment were installed in 1919, when a spur track was constructed to connect the mine workings with the Pacific Great Eastern Railway about half a mile distant.

Stewart — The Granby Consolidated Mining & Smelting Co., according to a statement from Stewart, proposes continuing its exploration of the George Group of claims on Bear River, Portland Canal. Dr. Bancroft has been making a thorough inspection of the property this summer and the Company is planning to proceed with extensive development next season. There has been some delay occasioned, it is explained because of the death of the owner, Richard George, and the necessity of awaiting the probate of the will before a clear title could be handed to the bank for placement in escrow.

Smithers Now a Mining Centre — Smithers, a few months ago a small and little known station on the Grand Trunk Pacific Railway some 200 miles east of Prince Rupert, is becoming rapidly a mining centre of importance and already it is a community of much interest in the West. Its proximity to Hudson Bay and Dome Mountains has brought it into the public eye. Early this year the Provincial Government began work on the construction of a road to the Henderson claims in the development of which J. F. Duthie had met with unusual success. While the men were at work and Mr. Duthie was making his plans for the summer's operations, the transportation and installation of plant, and so on, representatives of the Guggenheim interests had inspected and reported favorably on the properties, with the result that negotiations were instituted and control passed out of Mr. Duthie's hands for a substantial consideration. About the same time certain Dome Mountain prospects were taken over by the same interests. All this has served to concentrate attention on the district. Attention is directed to the fact that the mineral of Hudson Bay and Dome Mountains is on the same side of the Coast Range batholith as that of the Premier Mine. Prospecting consequently has been stimulated. New claims are being staked and meantime the exploration and development of the properties that have been the subject of the above transactions are proceeding actively. The construction of a road to Dome Mountain next year will be sought by those interested in the district.

Trail Ore Receipts — Ore receipts at the Trail Smelter. Consolidated Mining & Smelting Co., for the period August 22 to 31 totalled 5,349 tons. Shipments in detail follow:

	Tons
Blackrock, Northport	540
Company Mines	3,275
Cork Province, Zwicky	31
Knob Hill, Republic	153
Lightning Peak, Edgewood	3
Lone Pine, Republic Wn.	550
Quilp, Republic Wn.	482
Sally, Beaverdell	31
Silversmith, Sandon	284
Total	5,349

Gold Dredging on Peace River — The Peace River Gold Dredging Co. have been operating this summer on the upper waters of the Peace River. They have been using a drag line scraper plant. The Manitoba Peace River Gold Dredging Company have been working further down stream. From both sources good results are reported and it is said that the latter concern proposes if, values recovered continue until

the end of the season, putting a large gold dredge on the river. A small gold stamp mill was installed early this year at Mount Selwyn, close to the junction of the Findlay, Parsnip and Peace Rivers. The machinery was taken in from Prince George via the river route.

Britannia's Capacity is 75,000 tons — The Britannia Mining and Smelting Co., which started operations in February last after rebuilding its concentrator and completely re-establishing itself at Britannia Beach, is reported to have handled 75,000 tons of ore in the month of June. This is the predicted rating of the new mill. Some five hundred men are employed underground to maintain the maximum tonnage production.

Gold Strike Reported on Texada Island. — The Nutcracker Group of mineral claims, situated on Texada Island close to the Marble Bay Mine, is reported to have yielded recently some exceptionally fine looking samples of gold quartz. No authoritative word has been received regarding this strike, but the proximity of the property to the Marble Bay Mine, which was operated profitably for years, brings the story within the realm of possibility.

Accident at Trail — An electric ore train in the smelter of the Consolidated Mining & Smelting Co. was thrown upon the water main feeding the water jackets of the lead furnaces when the trestle over which it was running gave way beneath its 32 ton weight. The accident occurred on the morning of September 8th when the train was reversed to avoid collision with an approaching train. The train and its driver, Alexander Stephano, were thrown to the water main below. This was broken and Stephano's body was so lodged that the water played under heavy

Ainsworth — The Florence Mine, Ainsworth, has resumed operation after six weeks of idleness. The mill is handling about 60 tons of ore a day. It is estimated that $300,000 has been spent recently on underground and surface improvements, additions to plant, etc., among the latter being a new locomotive costing $10,000.

Coal Production During August — The coal production of the mines of the Province during the month of August 1923, totals 222,296 tons, an increase over the month of July of 9,489 tons, and an increase over the month of June of 36,136 tons. The production of the month of May was 59,984 tons lower than the production of August.

Of the total production for the month the mines on Vancouver Island produced 135,947 tons, a little over 61 per cent. of the total, and 3,316 tons more than was produced last month.

The Nicola-Princeton mines produced 21,591 tons, an increase of 4,870 tons over last month and nearly 10 per cent. of the total production.

The mines in the Crow's Nest Pass district produced 64,758 tons, an increase of 1,303 tons over last month's production and approximately 29 per cent. of the total production of the Province.

Of the mines of Vancouver Island, those operated by the Western Fuel Corporation of Canada show an increase of 4,181 tons over last month, while those operated by the Canadian Collieries (Dunsmuir), Limited show a decrease of 1,890 tons from last month's production. The Cassidy mine also shows a decrease of 388 tons, while the mines of the Nanoose Collieries show an increase of 1,537 tons over last month, and the mines operated by the East Wellington Coal Co., and King & Foster show a decrease of 44 and 80 tons respectively.

In the Nicola-Princeton district all the mines increased their production over last month, the Middlesboro Colliery by 1,910 tons, the Princeton Colliery by 947 tons, and the Coalmont Colliery by 2,013 tons.

In the Crow's Nest Pass District the Coal Creek Colliery shows a decrease of 1,434 tons and the Corbin Colliery a decrease of 50 tons under last month's production, but the Michel Colliery has an increase of 2,787 tons.

ALBERTA

The Trial Coal Shipments to Ontario — The coal shipped from Alberta to Ontario under the special rate of $7 a ton granted by the Canadian National Railways for a limited period is reported to be in strong demand. Howard Stutchbury, Trade Commissioner for Alberta, sent this word from the East, where he is busy distributing the 6,000 tons shipped for test purposes. As a result representations are to be made to the Federal Government with a view to obtaining an extension of the special freight rate in question. In this connection the Hon. Howard Ferguson, premier of Ontario, recently interviewed Sir Henry Thornton, president of the C. N. R., with respect to the facilitation of western coal shipments into Eastern Canada and is said to have offered some suggestions that were favorably received.

The Drumheller Strike — There is no word yet of the settlement of the coal miners' strike in the Drumheller District of the Province of Alberta. Wm. Sherman, president of District 18, U. M. W. of A., has ordered the men back to work, it being held that they are out in violation of their contract. At a recent mass meeting the men of the Drumheller and Wayne fields maintained that they would refuse to work until the operators consented to re-instate certain miners who were discharged some time ago.

NOVA SCOTIA

McLachlan Turned Down in Vancouver—Evidently J. B. McLachlan was not taken seriously in the West or he would have unhorsed Tom Moore and his vaulting ambition would have placed him in the saddle as President of the Trades and Labor Congress of Canada. Such no doubt was his aim when he left Nova Scotia, but he did not succeed, and wasn't even in the running. We might inquire if his failure was due to an insane miscalculation of his own power to move the multitude in his favor, or to an under-rating of the strength of President Moore, whose appeal is usually to the best that is in man and not to his worst and maddest passions. Was it due to the fact that outside of Cape Breton, (for on the mainland of Nova Scotia he has few friends), McLachlan has shown a lack of those qualities that attract men and stir them up to acts of mutiny and riot? More likely it was due to his entire ignorance of the methods that appeal to thoughtful men in carrying on business. McLachlan may find dupes in the West who are willing to become his instruments in a bad cause, but we very much doubt it. He perverted his office as District Secretary in Nova Scotia by using it to spread a pernicious and poisonous propaganda, and because of this was thrown out. He still persists in his pestilential campaign and

when Governments or other civil powers throw off their indifference and overcome their timidity and awake to their full responsibility, no place will be found for men who would wreck and ruin the country in the name of Socialism or any other radical movement.

Steel Works Busy — Not since the steel trade slowed down, after the war, have the Sydney steel works been so busy. It is too much, however, to expect that this condition will continue long, seeing that the steel industry of the United States is beginning to show signs of slackening. Another period of dullness will affect seriously the city of Sydney. It is mooted, however, that a fairly large rail order is in sight, which with present orders may help over the winter. A fourth blast-furnace is to be blown in to produce pig iron for sale. Orders for the products of the small mills are beginning to drop, and all indications point to reduced activities before long.

D. H. McDougall Resigns — The resignation of D. H. McDougall from the vice-presidency of the British Empire Steel Corporation is a distinct loss to the company. From the beginning of his connection with the coal and steel companies of his native province, twenty years ago, he has been allied consistently with the forces of progress. Since he undertook the active management of the new Corporation on its being formed two years ago, a notable improvement has been effected, particularly in the engineering branches. Mr. McDougall remains on the board of the corporation as a director. He will open offices as a consulting engineer after a brief vacation.

All Mines Re-Instated — After negotiations lasting several weeks, the last of the miners reported to have been "black listed" by the British Empire Steel Corporation for their part in the strike have been reemployed. Robert Baxter, once more on the board of the U. M. W. A., has been active on behalf of these men.

New Coke Ovens to Operate — Due to the increased activity at the Steel Works, as well as to the prospective market for coke as household fuel in the cities of the Maritime Provinces and Quebec, the new battery of 80 Koppers coke ovens is being warmed up for use. Two old batteries, totalling 120 ovens, are already in use. For domestic use the coke does not require to be so hard as for blast-furnace use; hence more volatile matter can be left in it, which means that it can be treated a shorter time in the ovens, and hence a larger production obtained from the ovens.

Imperial Oil Company Buys Benzol — A contract has been signed by the Imperial Oil Company to take the whole benzol output of the by-product plant at Sydney. This benzol is an excellent motor fuel, and has been obtainable by employees of the British Empire Steel Corporation at a reduced rate. Owing to the new contract, this privilege has been withdrawn.

Coal Output Well Above Last Year — In spite of the cancellation of coal contracts in Montreal and elsewhere due to the recent strike at the mines, 500,000 tons more coal than last year will be delivered in the Montreal market. At present the collieries are not busy, but are maintaining a fair output. The heavy coal stocks piled at the different collieries last winter are not yet all loaded away, there being 100,000 tons still at Sydney Mines and about 50,000 tons on No. 2 coal floors. This must be all shipped before winter sets in, to make room for fresh mined coal. Everything points towards a rather inactive season between this and the New Year in the coal industry. What the coming year has in store for the trade will depend largely on the condition of general business throughout Canada and the United States.

TUNGSTEN ORES

Tungsten ores are found along with tinstone, and also in quartz veins in gold regions. In Nova Scotia, the quartz veins in which the tungsten ores are found are mostly barren of gold; but in the Porcupine area, Ontario, schulite has been found in considerable quantities, closely associated with the gold; and the tungstite of the Kootenay Belle, B. C., carries gold values. The quartz veins in gold regions should be carefully examined for tungsten minerals, especially those veins of "bull" which appear to be unmineralized. Scheelite, even in considerable quantities is easily overlooked. Wolframite is more easily spotted.

In panning for gold, a very heavy white or yellowish tail may be scheelite, or a dark brown tail may be wolframite. Where gold ore is being concentrated on Wilfley or other tables, scheelite or wolframite would appear with the other heavy minerals. It is always possible that, in some exceptionable case, it might pay to save the tungsten mineral as a by-product.

MESABI SINTER

The Mesabi Iron Company at Babbit, Minnesota, has been producing sinter steadily. One of the large users is Henry Ford, who uses this high-grade material to mix with the low-grade limonite from his Imperial mine in the blast-furnaces at River Rouge.

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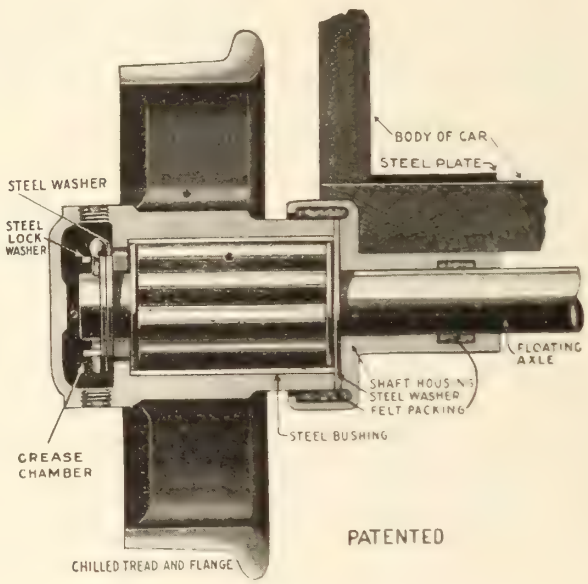

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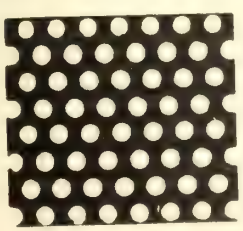

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Carries (Gravity):
Jones & Glassco, Reg.

Car Wheels and Axles:
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
John J. Garthshore.
Peacock Brothers, Limited.
Powley & Moody, Limited.
The William Kennedy & Sons, Ltd.

Cast Steel Gears:
Canada Foundries, Ltd.
The William Kennedy & Sons, Ltd.

Castings (Iron and Steel):
Herbert, Alfred, Limited.
Holman, Bros., Ltd.
Peacock Brothers, Limited.
The William Kennedy & Sons, Ltd.

Cement Machinery:
Hadfields, Limited.
Hull Iron & Steel Foundries, Ltd.
The William Kennedy & Sons, Ltd.

Chains:
Dodge Manufacturing Co.
Jones & Glassco, Reg.
Canadian Link-Belt Co., Ltd.
Greening, B. Wire Co., Ltd.
Powley & Moody, Limited.

Chain Drives:
Jones & Glassco (Regd).
Powley & Moody, Limited.

Chain Drives — Silent & Steel Roller:
Link-Belt Limited.
Hans Renold of Can., Ltd.
Jones & Glassco (Regd.).

Chemist:
Thos. Heyes & Sons.
Milton Hersey Co.
Ledoux & Co

Classifiers:
The Dorr Company.

Clutches:
Link-Belt Limited.
Hans Renold of Can., Ltd.

Coal:
Dominion Coal Co.
Nova Scotia Steel & Coal Co.

Coal Cutters — Coal Pick Machines:
Sullivan Machinery Co.
Canadian Ingersoll-Rand Co., Ltd.
Hebert, Alfred, Limited.
Holman Bros., Ltd.
Peacock Brothers. Limited.

Coal Crushers & Conveyors:
Link-Belt Limited.
Peacock Brothers, Limited.

Coal Mining Machinery:
Canadian Ingersoll-Rand Co., Ltd
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co. Ltd
Hadfields, Limited.
Hendrick Mfg. Co.
Hebert, Alfred, Limited.
Holman Bros. Ltd.
Powley & Moody, Limited.
Sullivan Machinery Co.

Coal Screening Plants:
Link-Belt Limited.
Canadian Mead-Morrison Co.

Cobalt Oxide:
Deloro Smelting & Refining Co., Ltd.

Compressors — Air:
Belliss & Morcom, Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Denver Rock Drill Mfg. Co.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Laurie & Lamb.
Smart-Turner Machine Co.
Peacock Brothers, Limited.

Concentrating Tables:
Herbert, Alfred, Limited.
Holman Bros., Ltd.
The Mine & Smelter Supply Co.

Concrete Mixers:
Gould, Shapely & Muir Co., Ltd.

Condensers:
Canadian Ingersoll-Rand Co. Ltd.
Belliss & Morcom, Ltd.
Laurie & Lamb.
Peacock Brothers, Ltd.

Condensers — Electrical Static & Power:
Griswold & Co.

Consulters and Engineers:
Milton Hersey Co., Ltd.

Conveyors:
Link-Belt Limited.
Canadian Mead-Morrison Co.
Jones & Glassco (Regd.).

Conveyor Belts:
Gutta Percha and Rubber, Ltd.

Conveyor Flights:
Hendrick Manufacturing Co.

Conveyor — Trough — Belt:
Dodge Manufacturing Co.
Link-Belt Limited.
Hendrick Mfg. Co.
Jones & Glassco, Regd.

Copper:—
Consolidated Mining & Smelting Co.

Countershaft Fixtures:
Dodge Manufacturing Co.

Couplings:
Dodge Manufacturing Co.
Hans Renold of Can., Ltd.

Cranes:
Link-Belt Limited.
Canadian Mead-Morrison Co.
Peacock Brothers, Limited.

Crane Ropes:
Allan Whyte & Co.
Canada Wire & Cable Co.
Greening B., Wire Co., Ltd.

Crucibles:
The Mine & Smelter Supply Co.

Crusher Balls:
Canada Foundries & Forgings, Ltd.
Herbert, Alfred, Limited.
Holman, Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
Peacock Brothers, Limited.
The William Kennedy & Sons, Ltd.

Crusher Jaws:
Canadian Steel Foundries, Ltd.
The William Kennedy & Sons, Ltd.

Crushing Rolls:
Canadian Steel Foundries, Ltd.
The William Kennedy & Sons, Ltd.

Crushers — Jaw & Gyratory:
Canadian Ingersoll-Rand Co., Ltd.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
Lymans, Limited.
The Mine & Smelter Supply Co.
Hadfields, Limited.

Cut Gears:
Hans Renold of Can., Ltd.
Jones & Glassco, Regd.
The William Kennedy & Sons, Ltd.

Cyanide:

Cyanide Plant Equipment:
The Dorr Co.
The Mine & Smelter Supply Co.

Diamond Drill Contractors:
Smith & Travers
Sullivan Machinery Co.

Diesel Engines:
Belliss & Morcom, Ltd.
Laurie & Lamb.
Lammers & Maase, Ltd.

Dies:
Canada Foundries & Forgings, Ltd.
Herbert, Alfred, Limited.
Hull Iron & Steel Foundries, Ltd.
Holman Bros., Ltd.

Dredging Ropes:
Allan Whyte & Co.
Greening, B. Wire Co., Ltd.

Dredges:
Canadian Mead-Morrison Co.

Dredger Pins:
Hull Iron & Steel Foundries, Ltd.

Dredging Machinery:
Hadfields, Limited.
Hull Iron & Steel Foundries, Ltd.

Drills — Air and Hammer:
Canadian Ingersoll-Rand Co., Ltd.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Herbert, Alfred, Ltd.
Holman Bros., Ltd.
Sullivan Machinery Co.
The Mine & Smelter Supply Co.

Drills — Core:
Canadian Ingersoll-Rand Co., Ltd.
Herbert, Alfred, Limited
Holman Bros., Ltd.
Sullivan Machineery Co.

Drill Steel Furnaces:
Canadian Ingersoll-Rand Co., Ltd.
Denver Rock Drill Mfg. Co.
Herbert, Alfred, Limited
Holman Bros., Ltd.
Sullivan Machinery Co.

Drills — Diamond:
Sullivan Machinery Co.

Drill Steel — Mining:
Canadian Ingersoll-Rand Co., Ltd.,
Hadfields, Limited
Mussens, Limited

Drill Steel Sharpeners:
Canadian Ingersoll-Rand Co., Ltd.

Drills — Electric:
Herbert, Alfred, Limited
Holman Bros. Ltd.
Sullivan Machinery Co.
Northern Electric Co., Ltd.

Drills — High Speed and Carbon:
Hadfields, Limited
Herbert, Alfred, Limited
Holman Bros, Ltd.

Ejectors:
Canadian Ingersoll-Rand Co., Ltd.

Electric Condensers:
Griswold & Co.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Herbert, Alfred, Limited
Holman Bros., Limited
Northern Canada Supply Co.

Electric Hoists:
Canadian Mead-Morrison Co.

Elevators:
Dodge Manufacturing Co.
Canadian Machinery Co.
Sullivan Machinery Co.
Link-Belt Limited.
Northern Canada Supply Co.
Hadfields, Limited.
Jones & Glassco (Regd.).

Engineering & Surveying Instruments:
Laurie & Lamb.

Engines — Ventilating:
Canadian Sirocco Co., Ltd.

Engines, Diesel:
Bellis & Morcom Ltd.
Laurie & Lamb
Lammers & Maase, Ltd.

Engines — Gas and Gasoline:
Belliss & Morcom, Ltd.
Sullivan Machinery Co.
Gould, Shapely & Muir Co., Ltd.
Laurie & Lamb.
The Mine & Smelter Supply Co.
Powley & Moody, Limited.

Engines — Haulage:
Canadian Ingersoll-Rand Co., Ltd.
Powley & Moody, Limited.

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Laurie & Lamb.

Engineers:
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Dorr Co.
Ferrier, W. F.
Hore, R. E.
Heves & Sons, Thos.
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McEvoy, James C.
Rogers, George R.
Ross, Jas. G.
Stewart, Robert H.
Tyrell, J. B.
Whitman, Alfred B.
Wilson, Ridgeway R.

Exhauster:
Canadian Sirocco, Ltd.

Ferro-Alloys (all Classes):
Canadian Steel Foundries, Ltd.

Fire Fighting Supplies:
Gutta Percha & Rubber, Ltd.

Flood Lamps:
Northern Electric Co., Ltd.

Flotation Oil:
Hercules Powder Co.

Fluorspar:
Consolidated Mining & Smelting Co.
Everitt & Co.

Forging:
Canada Foundry & Forging, Ltd.
Herbert, Alfred, Limited
Holman Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
Smart-Turner Machine Co.

Friction Clutches:
Dodge Manufacturing Co.

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Hull Iron & Steel Foundries.
John J. Gartshore.

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Mine & Smelter Supply Co.

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Canadian Ingersoll-Rand Co., Ltd.
Sullivan Machinery Co.

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Hendrick Manufacturing Co.

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Jones & Glassco, Regd.
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Gears (Cast):
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The William Kennedy & Sons, Ltd.
Hull Iron & Steel Foundries, Ltd.

Gears: Machine Cut:
The Hamilton Gear & Machine Co.
The William Kennedy & Sons, Ltd.

Gold Refiners:
Goldsmith Bros.

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Can. Chi. Bridge & Iron Works, Ltd.
Horton Steel Works, Ltd.

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Canadian Mead-Morrison Co.

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Dodge Manufacturing Co.

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Goodyear Tire & Rubber Co.
Gutta Percha & Rubber, Ltd.
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Hangers and Cables:
Stan. Underground Cable Co., Ltd.

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Canadian Sirocco Co., Ltd.

High Speed Steel:
Hadfields, Ltd.

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Canadian Rock Drill Co.
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Hoisting Towers:
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Metallurgical Engineers:
The Dorr Co.

Metallurgical Machinery:
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Powley & Moody, Limited.

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Molybdenite:
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Motors:
Peacock Brothers, Ltd.
Powley & Moody, Limited.

Motor Pulleys:
Dodge Manufacturing Co.

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The Mond Nickel Co., Ltd.

Oil Engines — Reverse:
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Canadian Mead-Morrison Co.
Herbert, Alfred, Limited.

Ore Sacks:
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Consolidated Mining & Smelting Co.
Everitt & Co.

Oils:
Hercules Powder Co.

Pavers:
Wettlaufers Brothers.
Gutta Percha & Rubber, Ltd
Laurie & Lamb.

Perforated Metals:
Hendrick Mfg. Co.
Canada Wire & Iron Goods Co
Greening, B. Wire Co.

Pillow Blocks:
Canadian Link-Belt Co., Ltd.

Pipes:
Consolidated Mining & Smelting Co.
The William Kennedy & Sons, Ltd

Pipe — Wood Stave:
Pacific Coast Pipe Co.
Mine & Smelter Supply Co.
Canadian Ingersoll-Rand Co., Ltd.

Piston Rock Drill—see Drills, Air & Hammer:

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Hendrick Mfg. Co.
The William Kennedy & Sons, Ltd
Horton Steel Works, Ltd

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Goldsmith Brothers

Pneumatic Tools:
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Herbert, Alfred, Limited.
Holman Bros., Ltd.

Portable Column Hoists: see
Canadian Ingersoll-Rand Co., Ltd
Denver Rock Drill Mfg. Co
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Sullivan Machinery Co.

Poultry Netting:
Greening, B. Wire Co., Ltd

Power Factor Correcting Devices:
Griswold & Co.

Power Condensers:
Griswold & Co.

Prospecting Mills & Machinery:
Mine & Smelter Supply Co

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Dodge Manufacturing Co
The William Kennedy & Sons Ltd

Pulleys — Iron, Steel, Wood Split:
Dodge Manufacturing Co

Pulverizers — Laboratory:
Herbert, Alfred, Limited
Holman Bros., Ltd.
Mine & Smelter Supply Co

Pumps — Pneumatic:
Canadian Ingersoll-Rand Co., Ltd
Smart-Turner Machine Co.
Sullivan Machinery Co.

Pumps — Steam:
Canadian Ingersoll-Rand Co., Ltd
Northern Canada Supply Co
Peacock Brothers, Ltd.
Smart-Turner Machine Co

Pumps-Turbines:
Smart-Turner Machine Co.
Canadian Ingersoll-Rand Co., Ltd
Laurie & Lamb.
Peacock Brothers, Ltd.

Pumps-Vacuum:
Canadian Ingersoll-Rand Co., Ltd
Smart-Turner Machine Co.
Peacock Brothers, Ltd.

Pumps — Boiler Feed:
Canadian Ingersoll-Rand Co., Ltd
Peacock Brothers, Ltd.

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Canadian Ingersoll-Rand Co., Ltd
Laurie & Lamb.
Peacock Brothers, Limited
Smart-Turner Machine Co.

Pumps — Diaphragm:
The Dorr Company.
The William Kennedy & Sons Ltd

Pumps — Electric:
Canadian Ingersoll-Rand Co., Ltd
Laurie & Lamb.
Peacock Brothers, Ltd.
Smart-Turner Machine Co.

Pumps — Sand & Slime:
Canadian Ingersoll-Rand Co., Ltd
Laurie & Lamb.
Mine & Smelter Supply Co
Sylvester Mfg. Co., Ltd

Pumps — Valves:
Peacock Brothers, Ltd.

Push Cars — See Cars, Push:
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Quarrying Machinery:
Canadian Ingersoll-Rand Co., Ltd.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Sullivan Machinery Co.

Quills:
Dodge Manufacturing Co.

Rails:
Hadfields, Limited.
John J. Gartshore.
Powley & Moody, Limited.

Refiners:
Goldsmith Brothers

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Hendrick Mfg. Co.

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Mine & Smelter Supply Co.

Roll Shells:
The William Kennedy & Sons, Ltd.
Canadian Steel Foundries, Ltd.

Rolls — Crushing:
Canadian Ingersoll-Rand Co., Ltd.
Hadfields, Limited.
Hull Iron & Steel Foundries, Ltd.
Herbert, Alfred, Ltd.
Holman Bros. Ltd.
Wettlaufer Bros.

Roller Chain:
Hans Renold of Canada, Ltd.
Link-Belt Limited.
Jones & Glassco, Regd.

Rope — Manilla & Jute:
Dodge Manufacturing Co.
Jones & Glassco, Regd.
Allan, Whyte & Co.

Rope — Wire:
Anglo Canadian Wire Rope Co.
Allan, Whyte & Co., Ltd.
Canada Wire & Cable Co.
Canada Wire & Iron Goods Co.
Dodge Manufacturing Co.
Dominion Wire Rope Co., Ltd.
Greening, B. Wire Co.

Rope Transmission Equipment:
Dodge Manufacturing Co.

Saline Refiners:
Goldsmith Brothers.

Samplers:
Canada Metal Co.
Ledoux & Co.
Milton Hersey Co.
Thos. Heyes & Son.
Mine & Smelter Supply Co.

Screens:
Canadian Ingersoll-Rand Co., Ltd.
Greening, B. Wire Co.
Hendrick Mfg. Co.
Canada Wire & Iron Goods Co.

Screens — Cross Patent Flanged Lip:
Hendrick Mfg. Co.

Screens — Perforated Metal:
Hendrick Mfg. Co.

Screens Shaking:
Link-Belt Limited.
Hendrick Mfg. Co.

Screens — Revolving:
Link-Belt Limited.
Hendrick Mfg. Co.
The William Kennedy & Sons, Ltd.

Separators:
Smart-Turner Machine Co.
Mine & Smelter Supply Co.

Sewer Pipes:
Wettlaufer Bros.

Shafting:
Dodge Manufacturing Co.

Sheet Metal Work:
Hendrick Mfg. Co.

Sheaves:
Dodge Manufacturing Co.

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Hendrick Mfg. Co.

Sheets and Dies:
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Peacock Brothers, Ltd.
The William Kennedy & Sons, Ltd.

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Sleeves:
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Sintering:
Dwight & Lloyd Sintering Co., Inc.

Smelters:
Goldsmith Bros.

Smoke Stacks:
Can: Chicago Bridge & Iron Co., Ltd.
Horton Steel Works, Ltd.
Hendrick Mfg. Co.
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Special Machinery:

Spelter:
The William Kennedy & Sons, Ltd.
Consolidated Mining & Smelting Co.

Sprockets:
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Dodge Manufacturing Co.
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Jones & Glassco, Regd.
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Spring Coil & Clips Electric:
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Hull Iron & Steel Foundries.

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Hull Iron & Steel Foundries, Ltd.
Hadfields, Ltd.
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Sullivan Machinery Co.
Peacock Brothers Ltd.
Canadian Ingersoll-Rand Co., Ltd.
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Canadian Mead-Morrison Co.

Steel Drums:
Smart-Turner Machine Co.

Steel Manganese:
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Hull Iron & Steel Foundries Ltd.
Canadian Steel Foundries, Ltd.

Steel Plate Construction — Light and Heavy:
Hendrick Mfg. Co.
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Steam Traps:
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Steel-Tool:
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Stone Breakers:
Holman Brothers, Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Denver Rock Drill Mfg. Co.
Herbert, Alfred, Limited.

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Canadian Ingersoll-Rand Co., Ltd.
Denver Rock Drill Mfg. Co.
Sullivan Machinery Co.

Structural Steel Work — Light:
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The William Kennedy & Sons, Ltd.

Sulphate of Copper:
The Mond Nickel Co., Ltd.

Surveying Instruments:
C. L. Berger.

Switches:
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Tables — Concentrating:
Mine & Smelter Supply Co.

Tanks:
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Tanks — Acid:
Hendrick Manufacturing Co.
Ontario Wind Engine & Pump Co.

Tanks — Wooden:
Gould, Shapley, & Muir Co., Ltd.
Ontario, Wind Engine & Pump Co.
Pacific Coast Pipe Co., Ltd.
Mine & Smelter Supply Co.

Tanks, Cyanide, Etc.:
Hendrick Mfg. Co.
Ontario Wind Engine & Pump Co.
Pacific Coast Pipe Co.

Tanks — Steel:
Canadian Ingersoll-Rand Co., Ltd.
Hendrick Mfg. Co.
The William Kennedy & Sons, Ltd.

Tanks — Oil Storage:
Hendrick Manufacturing Co.

Tanks — Water & Steel Towers:
Hendrick Manufacturing Co.
Ontario Wind Engine & Pump Co. Ltd.

Tires — Auto, Truck and Bicycle:
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Gutta Percha & Rubber, Ltd.
Hadfields, Ltd.
Powley & Moody, Limited.

Track, Manganese Steel:
Canadian Steel Foundries, Ltd.

Trackworks — (Manganese-Steel):
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Canadian Steel Foundries, Ltd.

Tramway Points & Crossings:
Hadfields, Limited.

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Northern Electric Co., Ltd.

Transmission Appliances:
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Transmission Machinery:
Link-Belt Limited.
Hans Renold of Canada, Ltd.
Jones & Glassco, Regd.
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Trucks:
Hammant Steel Car & Eng. Works.

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Powley & Moody, Limited.

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Canada Foundries & Forgings, Ltd
Herbert, Alfred, Limited.
Holman Bros., Ltd.
The William Kennedy & Sons, Ltd.
Mine & Smelter Supply.

Tube Mill Balls:
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Holman Bros., Ltd.
Herbert, Alfred, Limited.
Hull Iron & Steel Foundries, Ltd.
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The William Kennedy & Sons, Ltd.

Tube Mill Liners:

Turbines — Waterwheel:

Turbines — Steam:
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The William Kennedy & Sons, Ltd.

Turbines:
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Laurie & Lamb.
Herbert, Alfred, Limited.
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The William Kennedy & Sons, Ltd.

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Wire Rope Fittings:
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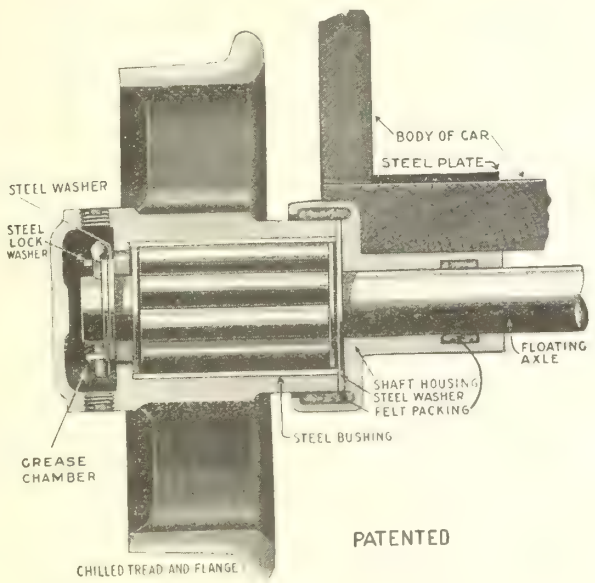

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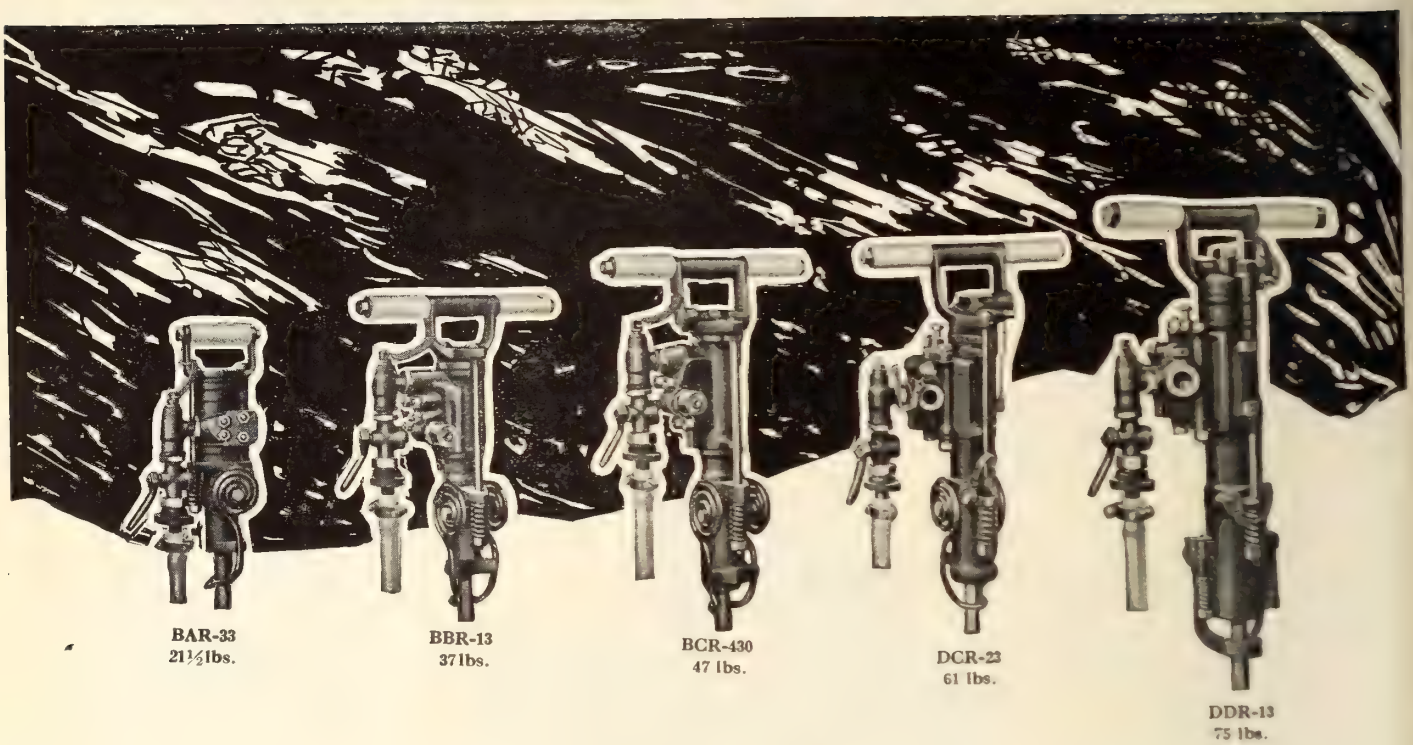

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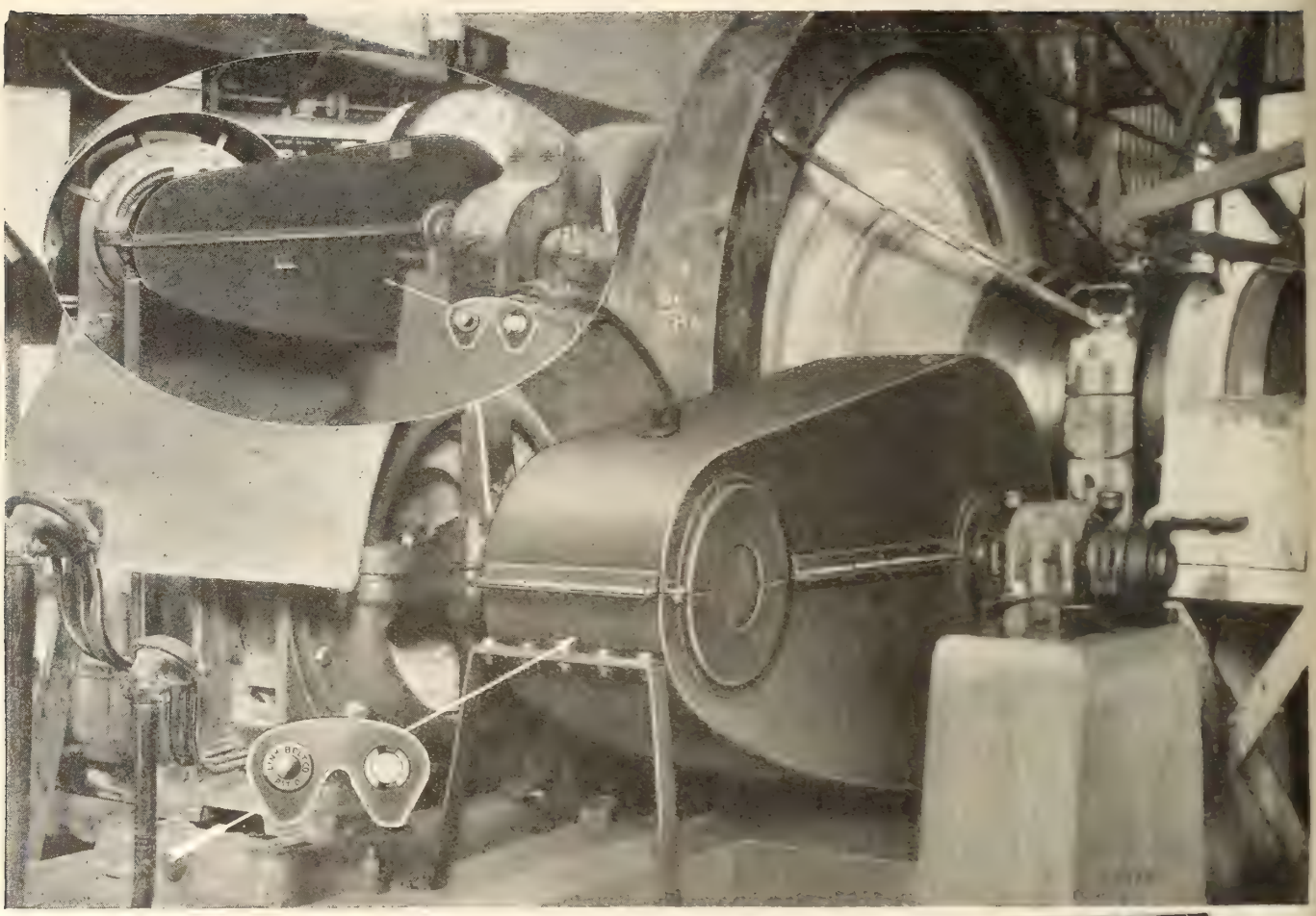

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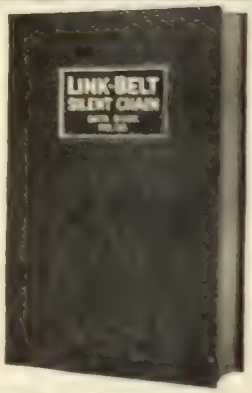

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Ontario's Minerals

PROVINCE OF ONTARIO

Hon. CHARLES. McCREA, Minister. DEPARTMENT OF MINES *Thos. W. Gibson*

Mineral Areas

Ontario, with its 407,262 square miles, contains many millions of acres in which the geological formations are favourable for the occurrence of minerals 70 per cent of the area being underlain by rocks of pre-Cambrian age. The phenomenally rich silver veins of Cobalt, Gowganda and South Lorrain occur in these rocks; so also do the far-famed nickel-copper deposits of Sudbury, the gold of Porcupine and Kirkland Lake, and the iron ore of Magpie and Moose Mountain mines.

Economic Minerals

In addition to the above, practically all economic minerals (coal and tin excepted) are found in Ontario: — actinolite, apatite, arsenic, asbestos, cobalt, corundum, feldspar, fluorspar, graphite, gypsum, iron pyrites, lead, mica, molybdenite, natural gas, palladium, petroleum, platinum, quartz, salt, talc and zinc. This Province has the largest deposits on the continent of talc, feldspar, mica and graphite.

Building materials, such as ornamental marble, limestone, sandstone, granite, trap, sand and gravel, lime, Portland cement, brick and tile, meet every demand.

Mineral Production

Preliminary returns show the output of the mines and metallurgical works of the Province for the year 1922 to be worth $62,202,169, of which the metallic production was $38,190,711.

The following figures show the growth of Ontario's mineral industry by five-year periods since 1891 when a Bureau of Mines was first established.

Year.	Value.	Year.	Value.
1891	$4,705,672	1911	$41,976,797
1896	5,235,003	1916	65,303,822
1901	11,831,086	1918 (Maximum war output)	80,308,972
1906	22,388,383	1921	48,128,387

Dividends and bonuses paid to the end of 1922 amounted to $28,096,699 for gold mining companies, and $86,238,185 for silver mining companies or a total of $114,334,884.

Mining Regulations

A miner's license costs $5.00 per annum, and entitles the holder to stake out in any or every mining division three claims of 40 acres each. After performing 200 days' assessment work on a claim, patent may be obtained from the Crown on payment of $2.50 or $3.00 per acre, depending on location in unsurveyed or surveyed territory.

Assay Office

The Provincial Assays Office at No. 5 Queen's Park, Toronto, is maintained by the Department of Mines for the free identification of minerals, free assays under the provisions of the Mining Act of Ontario, and also for general assay work as per the Schedule of Charges which may be obtained on application.

Temiskaming Testing Laboratories

The Department maintains, at Cobalt, an ore sampling and testing laboratory which is now prepared to receive parcels of gold ore from 100 pounds upward, and after sampling and assaying the same to pay to the shipper the value thereof, less treatment charges. The purpose is to afford a market for ores extracted by prospectors and others in developing their mining claims, enabling them to obtain funds which they can use for further work and to report on the most satisfactory method of treatment. Fuller information may be obtained on application to the Manager, Temiskaming Testing Laboratories, Cobalt, Ontario.

Publications

For list of publications, illustrated reports, geological maps and mining laws, apply to

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Deputy Minister of Mines,
TORONTO, CANADA

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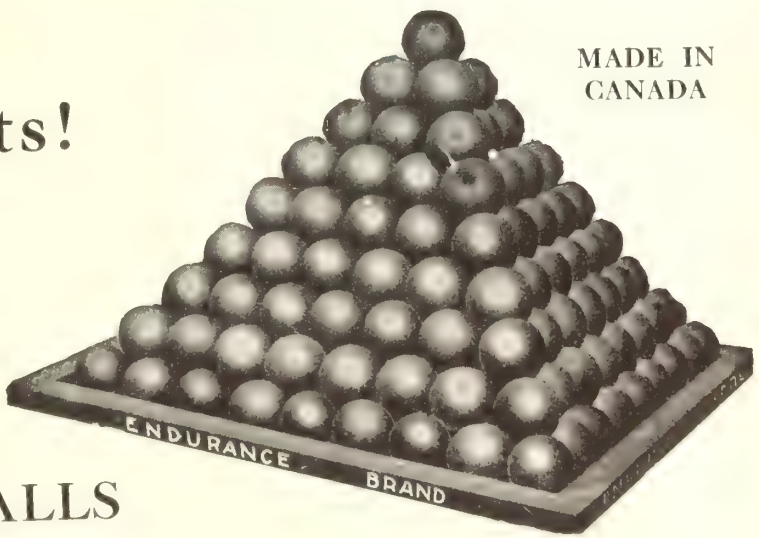

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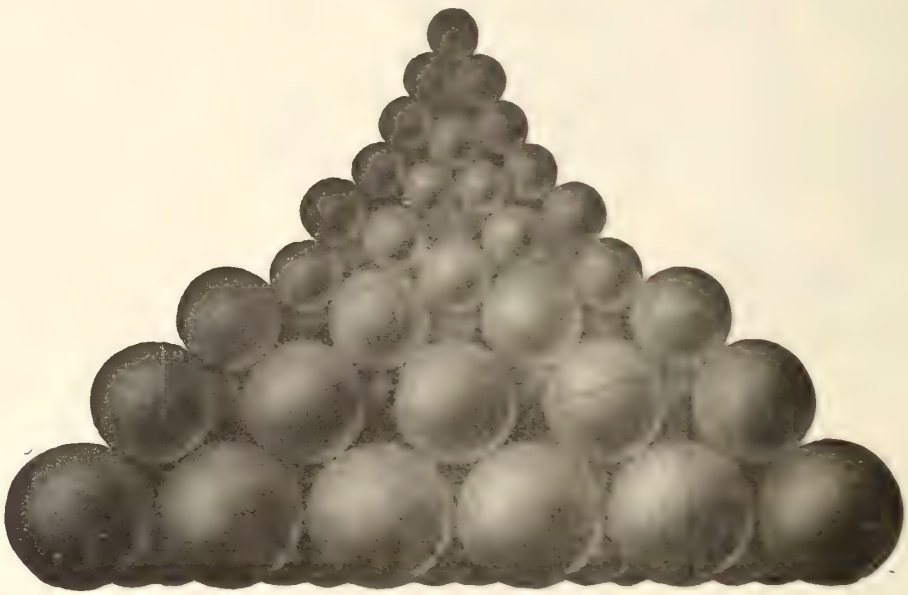

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PUBLISHED WEEKLY

Devoted to the Science and Practice of Mining, Metallurgy and the Allied Industries; and more particularly to their progress in Canada

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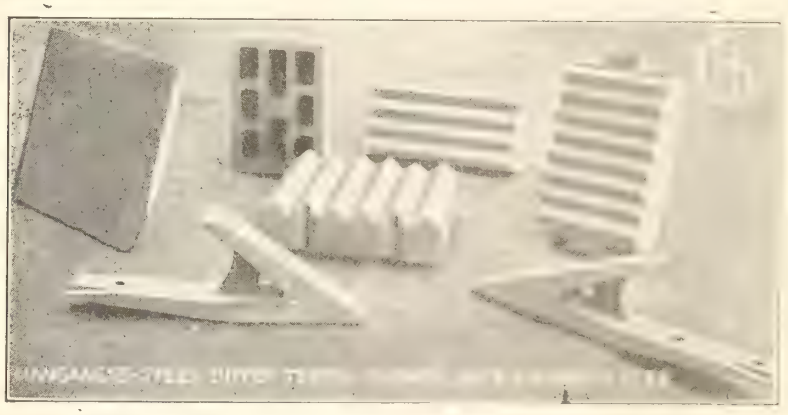

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:-: EDITORIAL :-:

LAKE FORTUNE AND NORANDA

The work of prospecting and development in the gold district of northwestern Quebec during the season now drawing to a close has been productive of highly satisfactory results. The faith of the handful of men who have persisted in their search in spite of discouragement has been more than justified. Unless evidence obtainable at the surface should be belied by underground development, Quebec has now in sight two substantial gold mines, with more to follow.

On another page there is described the property of the Lake Fortune Mining Company. The examination of the surface showings has of necessity remained incomplete; but the operators, who are men of wide experience in preliminary mining development, are so confident of what underground exploration will disclose that they have committed themselves to an extensive programme. Twenty-five tons of camp supplies are now on the way to Lake Fortune by canoe. Mining equipment is already on the ground. Within a couple of weeks mining operations will be under way. Before next spring the nature of the ore-body at the 200-foot level will have been at least partially disclosed. A mill is ready to operate as soon as the development of ore shall have justified it.

Twelve miles to the east of Lake Fortune, on the property of Noranda Mines in Rouyn township, intensive prospecting has disclosed what is, judging by all evidence available so far, a phenomenal body of gold ore. In a recent communication to shareholders, the managing directors, Messrs. Thompson and Chadbourne, announced the discovery on the most southerly of their group of claims of a mineralized zone carrying good values over a width of ninety feet, and high values across lesser widths. At that time there were two trenches across the ore-body. Last week there were a dozen or more such trenches, and these confirmed the hopes based on what the first disclosed.

The ore is an altered rhyolite, impregnated with pyrite and quartz, and containing as well rusty-weathering carbonates, tourmaline and galena. Gold is visible in many places. A large part of the low-lying ridge showing above the mantle of clay that covers most of the ground is composed of this gold-bearing material. Weathering has reduced it to gossan, and it is necessary to dig and blast through this in order to determine the original nature of the ore and to sample it fairly. The length of the gold-bearing zone as determined by these trenches up to last week was approximately 600 feet, and its width, over 300 feet. It remains to be determined how much of this constitutes ore of milling grade.

A thorough examination of the original vein of the Noranda property upon which such high hopes were built last winter was distinctly disappointing, and it appeared a few weeks ago as if the property would have to be abandoned. Now some intensive prospecting performed on outlying claims in the performance of assessment duties has changed failure into success. A diamond-drill and a small mining plant are already on the ground, and both will be put to work on the new discovery. The difficulty of summer travel into the heart of Rouyn township will, unfortunately, impede the delivery of supplies and machinery at the Noranda camp; but once the snow comes an excellent winter road from the railway will speed up operations. If half the promise of this new Noranda outcrop is fulfilled, Quebec will have a gold mine of world-wide repute.

Meantime prospecting of the intensive variety has had very satisfactory results in two additional widely separated localities, one in Rouyn township and the other in Dasserat township within a comparatively few miles of the Ontario boundary. It is still too early to disclose the exact location of these discoveries or to attempt to gauge their ultimate value; but the owners, who are experienced engineers and well able to judge, have prepared to investigate thoroughly the first promising showings.

Summing up the evidence at present available, it seems that the first full season's work in the new goldfield of Quebec has justified our early hopes, and that productive mines will be operated in the near future in the western part of the belt. We hope we shall be able to say the same of the eastern section before the season is through.

ANOTHER ATTACK ON THE PROSPECTOR

The *Canadian Forestry Magazine*, now known as *Illustrated Canadian Forest and Outdoors*, persists in its calumny of the prospector as a fire-bug. Half its editorial space in the September issue is devoted to the question, "Grub-Stakers or Tall Timbers?" We have already shown in these pages that, although we deplore the prevalence of forest fires and stand ready to condemn the carelessness of all who set them, yet we are not prepared to accept the estimate of the *Canadian Forestry Magazine* and other equally ill-inform

ed as to the comparative measure of the prospector's guilt. The editorial in question cites three fires. About the first we have no information. The second one mentioned is known to have been set by a fire ranger. The third one, on the road to the Rouyn gold area, we crossed three weeks ago, and found on inquiry that it had been started by road-builders working for the Department of Colonization of Quebec. We know, on the other hand, of a fire during the present season that was set by prospectors; but the damage it did was of comparatively limited extent.

If those who talk and write thus loosely about the prospector's predominant responsibility in the destruction of our forests by fire, will take the trouble to learn the facts, they will moderate considerably their present attitude. From first-hand knowledge we know that prospectors in general are not guilty. We have taken pains to trace to their source recently a number of fires, and in all but the one instance mentioned, the lumberman, the settler or the road-builder has been that source. Let us be fair to the prospector.

"UNDISCOVERED MINES"

A paper is to be presented by Dr. W. L. Uglow at the Trail meeting of the Canadian Institute of Mining and Metallurgy on October 17th in which he deals with the problems of mine discovery, and discusses in a constructive way the means by which it may be assisted. It is published in the October issue of the *Bulletin* of the Institute.

Not long ago, the question was asked by the head of a Canadian Government Department. "Why it is that capitalists do not seen anxious to acquire prospects in Canada?" The want of understanding implied by this question is reflected also in the attitude of owners of prospects in the valuing of their properties.

The fact is that the attraction of a prospect depends as much upon the external conditions with which it is associated as upon its own intrinsic potentialities. There is always an inherent attraction in prospects, as there is in everything connected with a risk; it is the very human attraction toward gambling,—taking chances. One hears of the gambling fever; it is a very apt term; no fever is constant for long, and the gambling spirit has its ups and downs in the same way. The present is not a day of high-temperature gambling, of winning or losing on a throw, or of thousand-to-one chances, or having all one's eggs in one basket. It is a day of more cautious procedure, and of reasonable risks.

The risks of mining are notorious. Chiefly they are connected with the hazards of exploration and development. One has to be prepared for many disappointments in the hunt for a mine. Dr. L. C. Graton's parable of the battleship is pertinent. He says: "Suppose a new battleship goes to sea to try her big guns at target practice. The explosive and projectile for each shot cost $250. Assume the Navy average for vessels of that class is nine shots to one hit, and that our particular ship sustains that average. Here, on the deck, lie nine projectiles; one will hit the target, yet no one can tell which one, for they all look alike. The nine shots are fired; one hits; that one represents an expense of $250, yet it really cost $2,250 to hit the target once. A prize of $1,500 offered by the company that built the ship, if the crew would equal the Navy average of one hit in nine shots, might seem to yield a handsome return if one thinks only of the single shot that reached the mark; but in reality, the prize, instead of affording a surplus, leaves a deficit."

Dr. Graton also cites an instance of a company in South America that investigated 143 prospects in order to find one mine. Admitting that such pertinacity is unusual, one has to admit that the number of unprofitable investigations is likely to be large before a winner is found. This fact constitutes the principal hazard in mining, and it is clear that it may be immensely aggravated by injudicious methods of selection.

A poultry breeder recognizes a certain risk-factor in the matter of incubation, but it would be seriously affected if he bought cold-storage eggs to experiment with. In the same way, an investor wants to know how many chances he has of finding a mine in a new field, before he will wax enthusiastic about it. A one-mine field is bad enough, but a one-prospect country leaves the investor cold.

It is the country that requires to be known first, and the opportunities that it offers for the discovery of mines. If the chances of success are reasonable, there are plenty of people ready to risk their money in it, to whom appeal may be made in vain on behalf of individual prospects. This is a reasonable attitude, irksome though it may seem to the optimistic prospector or promoter, and it calls for practical steps by which an estimate may be made of the country's possibilities, by which means the investor may be provided with a gauge to estimate his risk, whether he requires a ten-to-one, a fifty-to-one or a 143-to-1 chance.

What sort of a chance, for example, is that presented just now in British Columbia? Is it to be measured by past records, or can these be bettered? The record can undoubtedly be improved, since the element of chance in mining everywhere can be reduced by the adoption of scientific methods in prospecting and investigation. Herein lies the route for the Province's waning activities in prospecting. When we are worried by symptoms of its lack of vitality, we should ask ourselves not "what is the matter with the country", but "what is the matter with us". Dr. Uglow's argument is to show that British Columbia is a field that can be made to attract capital, and he shows us how to go about it.

MR. ROBB AND IMMIGRATION

The Hon. J. A. Robb, recently appointed Minister of Immigration and Colonization, has issued a statement outlining a new policy of immigration. And we believe that its whole-hearted adoption and prosecution would help very largely to augment the tide of immigration to these shores. In such very largely augmented volume of immigration is to be found the solution — or, at any rate, a large part of the solution — of nearly all of our most pressing national problems, including the most pressing of all, that of the Canadian National Railways.

So far as it is possible, we are most solicitous that this augmented immigration should come from Great Britain. The Dominion Government, some time ago, formulated certain plans for obtaining immigration from this source. But, as we took occasion to point out at the time, these plans of the Government did not go far enough and showed scant likelihood of adding very largely, in the near future, to the number of producers in this country. In fact, we have never been able to regard them as, in any sense, adequate to the imperative exigencies of the circumstances in which Canada finds herself. Mr. Robb now announces that "in co-operation with the British Government, under the terms of the Empire Settlement Act, it is proposed to extend the schemes affording assistance to those of the agricultural and home-worker classes from the Mother Country." This announcement may mean much or little—let us hope it means much.

For our part, however, we have always recognized that, even at the best, all Canada's immigration needs cannot be supplied by the Mother Country. For one thing, we need more than the latter can furnish of the right stamp. For another, there are certain classes of rough work for which immigrants from the more Southern of European countries seem better suited. All such industrious European settlers as are capable of being transformed into Canadian citizens should be made welcome in the interests of the Dominion at large. In this connection, we are confident, subject to the proviso in our next sentence, that, in announcing that "as the British Isles alone cannot furnish a sufficient quota of the agricultural classes, efforts will be made to encourage immigration from certain areas of the continent of Europe and from the United States," Mr. Robb is proposing to proceed along sound lines. That is, always provided that it is regarded as essential, that, if settlers are brought to Canada from certain of the Southern European countries, they should be carefully hand-picked in Europe. For there is a danger — and this fact has been impressed on Canadians during the late war — in bringing to this country, in any really large numbers, aliens who are resolved not to be absorbed and assimilated, but rather to form colonies of their own and adhere to alien mental and political standards. Great care is needful in their selection.

It is announced that "facilities will be offered for the immigration of such skilled and unskilled labor (other than agricultural) as Canada may require from time to time." With this we are in hearty accord. We believe that it is necessary to open the doors wide if we are to bring to this country such a volume of immigration as will both substantially increase production and add to the wealth of the Dominion. We want to see the doors opened not only to farmers and farm laborers, but also to such an extent in other directions as will enable our manufacturers and business men to secure the skilled workers and other help they require in their industries. At present, they cannot get these. Nor will they easily be able to do so, if the Labor unions in this country can work their sweet will. We have a shrewd idea that it is the fear of offending these Labor unions that has been responsible for the lethargy and laxity that the Government has so long displayed in this matter of immigration.

As we have said, we are generally in agreement with Mr. Robb's enunciation of the new immigration policy. But, after all, "fine words butter no parsnips." The Government will be judged by deeds, not words. It has hitherto been so slack and procrastinating with regard to this question, all-important as it is, that one may well be pardoned for not being ultra-sanguine as to its policy being now inspired by a new spirit.

A FOOL AND HIS MONEY —

Here is an interesting letter from one of the *Journal*'s readers:

"A man whose business experience has been successful and honourable called on me the other day to ask for a suitable investment in mining for a considerable sum of money. When told that the approximate cost of investigating the merits of a certain mining undertaking known to be in need of additional capital would be about 2½ per cent. of the proposed investment, he hastily replied, — 'Oh, I never heard 'of that being done in a mining matter. But if you ' know of a chance that you consider good, I should be ' glad to get into it without any expense of that kind.'

"Now this man has been a banker and a broker. He was in earnest, and I do not think he had any thought of being what he actually was on this occasion,—a mere 'piker'. He knew that securities offered by reliable underwriters are first carefully investigated from both the physical and the financial sides of the proposal. But a mining proposition he regarded as something that might as well be estimated by hearsay.

"Can't you write something in the *Journal* to enlighten this poor cuss, and others like him?"

Our correspondent has put the case so succinctly that we can add nothing to his exposition of the case. Nevertheless we should be glad to have the views of [illegible]

Lake Fortune Gold

Description of Promising Property in Northwestern Quebec

By THE EDITOR

The gold belt of northwestern Quebec is now known to contain more than one deposit of gold whose outcrops rank with the best, and whose development promises to make mines of some importance. Among these the Lake Fortune Mining Company's property is outstanding. I visited it in the middle of September, and learned at first hand the following facts:

Location and Communications

Lake Fortune is on the gold belt that extends eastward from Matachewan and Kirkland Lake in Ontario for 100 miles into Quebec. It is ten miles east of the inter-provincial boundary, astride the Dasserat-Boischatel township boundary. A good winter road connects it with Dane station on the T. & N. O. Railway, and from Lake Fortune to Larder Lake this road is used as a trail, 14 miles long, in summer. It is 45 miles south of La Sarre, on the Canadian National Railways (Transcontinental line), with which it is connected by an excellent and direct canoe route. Forty-five miles to the south is the Quinze River. Lac Des Quinze, Barriere Lake and Opasatika Lake form a waterway from the Quinze water storage dam to the north end of Opasatika Lake, which is 2½ miles by road from the Lake Fortune camps. This route is navigable throughout by small steamers except for a 1,000-foot portage between Barriere and Des Quinze Lakes.

Within a few weeks the Kipawa extension of the C. P. R. will be in operation to the Quinze dam, whence the water route northward, approximately 50 miles in total length, is available as mentioned above. The Larder Lake branch from Swastika on the T. & N. O. is now under construction as far as the two gold properties of Crown Reserve and Associated Goldfields north of Larder Lake, which will bring the steel to within 17 miles of Lake Fortune; but the interprovincial boundary intervenes.

Roads and Agricultural Land

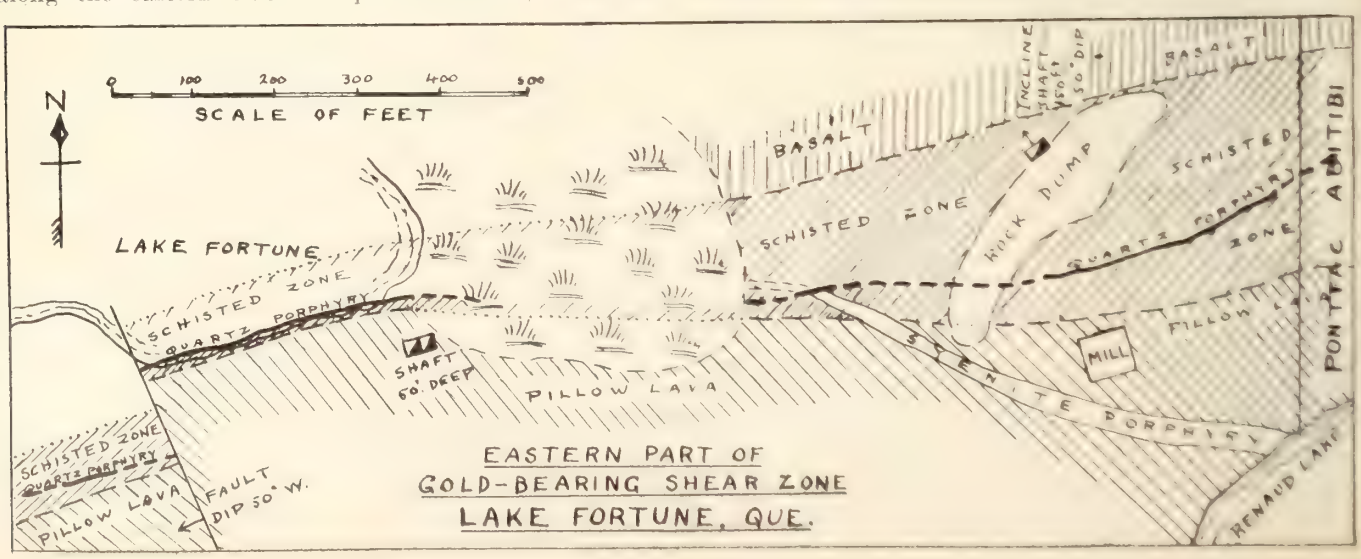
Lake Fortune is near the southern edge of the Great Clay Belt, and a number of colonization roads are being pushed forward in its direction. The southerly extension or lobe of clay land that includes New Liskeard and Ville Marie extends northward without interruption along the eastern side of Opasatika Lake, from Des Quinze river. A colonization road extends from North Temiskaming at the mouth of Des Quinze, about halfway to the southern end of Opasatika Lake, a total distance of 25 miles, all through good agricultural land. Last spring the Quebec Government made a grant of $15,000 towards the completion of this road. This sum has been expended mainly in re-location and clearing a part of the new road. It is expected the grant will be renewed, on a more adequate scale, during the coming year.

Settlement along the Transcontinental line on the Quebec side of the boundary has proceeded with remarkable rapidity since it commenced in earnest in 1917. A strip of approximately 10 miles in width along each side of the railway is now settled for a hundred miles eastward and roads constructed for this distance. Those from La Sarre and Makamik are already within 30 miles of Lake Fortune and are being pushed forward steadily with the settlement. Either could be built through to Lake Fortune to advantage, as the good agricultural land extends throughout the whole distance.

It may be noticed in passing that the 100-mile gold belt lies approximately along the southern edge of the Great Clay Belt. The area of the section of the clay belt between it, the Canadian National railway and the interprovincial boundary is somewhat greater than that of the Eastern Townships of Quebec, while the proportion of arable land is much greater. This intimate relation of prospective mines and agricultural land in such large amount is of prime importance to the province.

General Geology

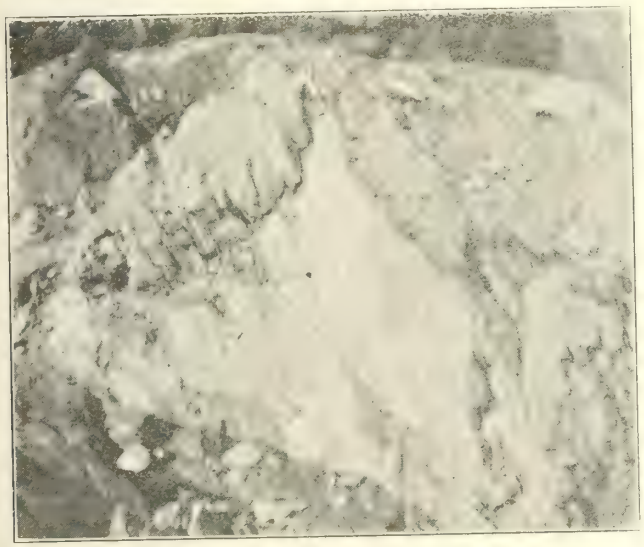
The geology of the area is described by M. E. Wilson (G.S.C. Memoir 39) and by H. C. Cooke (G.S.C. Summary Report 1922, Part D.) The gold occurs in this case, as in numerous others, in lava flows of Keewatin age, not far from their contact with superimposed conglomerate of the Temiskaming series, the bedding planes of both being now in an approximately vertical position. At a distance of ten miles or more to the south, and also presumably underlying the older rocks, is the great granite batholith. A later intrusive, which is considered to have brought in the gold, is in evidence as dykes and bosses of acidic porphyries.



South of Lake Fortune is a strip of sedimentary rock of the Cobalt series, which overlies and conceals the contact of the Keewatin volcanics and the Temiskaming conglomerate. To the southeast at a distance of about a mile this Cobalt conglomerate has been eroded sufficiently to expose a large intrusion of syenite porphyry intruding Temiskaming conglomerate.

Geology of the Ore Deposit

The principal geological features of the Lake Fortune property is a shear zone, indicated by Cooke on his



Lake Fortune Ore
Schist with stringers and irregular masses of quartz. The ore in places resembles closely some of that of the Porcupine camp, particularly that of Hollinger. Hammer shows strike and dip of schist.

map as a fault running east and west for a distance of over a mile. The company's property covers three-quarters of a mile of this zone, one-half mile of it east of the Boischatel-Dasserat boundary and one quarter to the west. The zone has been explored partially on the surface for a distance of 1,500 feet from the eastern boundary. Little or nothing is known at present of the remaining 2,500 feet. Indeed, only a beginning has been made in examining the eastern part; but this has disclosed several features of geological interest.

The shear zone is in lava of Keewatin age, and consists essentially of schisted lava. On the south the rock is principally lava with "pillow" structure. On the north side basalt is the principal rock. The zone conforms roughly with the bedding planes of the lava. It dips at 50 degrees to the north, and is from 80 ft. to 350 ft. wide, as so far determined.

A dyke of syenite porphyry cuts the pillow lava and the schisted zone, as indicated on the accompanying sketch plan. There is no indication as yet that this dyke is connected directly with the gold deposits it is hoped to mine profitably.

A narrow dyke of quartz porphyry, up to about four feet in width, extends irregularly throughout the shear zone so far as examined. It cuts the syenite porphyry dyke. Most of the shoots and pockets of high-grade gold ore so far discovered occur in intimate contact with this dyke of quartz porphyry.

A fault with a lateral displacement of 130 feet and a dip of 50 degrees to the west intersects the shear zone as indicated on the plan. High-grade ore has been found in this fault. The lateral and vertical extent of this ore have not been determined.

Mineral of the Shear Zone

The schist of the shear zone is intersected by a multitude of veins, veinlets and irregular small masses of quartz, distributed unevenly throughout the zone. There is a similarly uneven distribution of pyrite throughout the schist, mostly as small crystals. In places this pyrite constitutes the major part of the rock material, but only in very restricted areas.

Where the foot-wall of the schisted zone appears along the shore of Lake Fortune, molybdenite is distinctly in evidence, in conjunction with high gold values, alongside the quartz porphyry dyke.

Though there have been some spectacular nuggets of gold found in the quartz and the schist, these occurrences are rare. Most of the gold is in a finely divided state and is separated readily from the rock by panning after crushing to a moderate degree of fineness. The evidence available so far goes to show that simple amalgamation will recover most of the gold.

Panning shows that there is gold everywhere throughout the schisted zone. Both panning and the assays of channeled samples show, however, that these values, probably the result of the first deposition of gold in the zone, are not workable except where concentrated. The evidence available to date indicates also that the gold values are mostly in the quartz and the schist. It is not known as yet what proportion is in the pyrite.

Payable Ore

When the present examination of the Lake Fortune property was begun last May by Messrs. Alderson and MacKay, the work on the ground consisted of two shafts, one south of the schisted zone and the other on its northern edge or hanging wall, and a number of small pits on outcrops. Today trenches cross the zone in places where the overburden allows, channel samples have been taken along these trenches and in the old pits, and the shoot of high-grade ore along the shore of Lake Fortune has been stripped. At present an

Outcrop of schist cut by quartz stringers, of the incline shaft. High gold values and spectacular samples have been found at this spot.

attempt is under way to lower the water of the lake by deepening the outlet, in order to allow systematic sampling across this ore-shoot. In the meantime the values disclosed by panning and by the assays of such samples as it has been possible to take along this enriched zone virtually compel vigorous development.

As noted above, most of the high-grade ore so far discovered occurs along the quartz porphyry dyke. On the shore of Lake Fortune it runs close to the foot-wall of the shear zone, and is divided into two or three parallel small dykes. Alongside these little dykes there is ore of remarkable richness, extending for a length of

about 200 feet and with a total width of four to six feet. Owing to there being only a narrow strip either above water or within arm's length under water, the width can be determined definitely only by exploration underground. Meantime a stoping width of about five feet of rich ore is indicated. It is not known at present how far the high values will extend beyond this width.

At a number of other places where it has been possible to examine the schist along the quartz porphyry dyke, spectacular specimens and high assay values have been found. Up to the present, these values have proved to be somewhat erratic, and no continuous body of high-grade ore has been delineated with the exception of that along the lake shore. It must not be assumed, however, that there are no other ore-shoots, for the amount of this preliminary surface exploration has been so small and it has been scattered along such a length that it can be counted only as a beginning. For instance, all the present information points to the foot-wall of the zone as the best prospecting ground; but this is so deeply

Channel sampling across the shear zone hammer shows strike and dip of schist.

covered with drift that it can be examined only along the edge of Lake Fortune, where the first ore-shoot is indicated.

Projected Development

The new owners of the Lake Fortune property have determined to "follow the gold" — a good rule in any case. Before exploring at large throughout the schisted zone, they will determine the extent and value of their first ore-shoot. Hemmed in by the lake to the north and by a swamp to the east, the possibilities of surface examination already have been almost exhausted. An old vertical shaft 50 feet deep will aid in underground exploration. This will be continued to 100 feet or more in depth. A cross-cut of slightly less length driven to the north should intersect the foot-wall of the ore body under the end of Lake Fortune, whence exploration drifts in any direction can be run at will. There is already a drift from the bottom of the 50-foot shaft northward for 20 feet—too short a distance to reach the foot-wall—but this will not be driven further. This underground prospecting will be the surest and cheapest means of investigating the ore-body further.

The shaft to the east is an incline at 50 degrees in the hanging wall of the shear zone, 150 feet deep. From the bottom a drift was run northward into the basa't for 400 feet, presumably in an attempt to reach a quartz vein in that direction. Another drift was run for a short distance southwest into the schist. It is not known what values this latter disclosed.

Mining Equipment and Mill Already on the Ground

All the equipment required for mining on a small scale is on the ground and in good condition, having been installed by former owners. In addition there is a small mill, which can be put into commission at small expense. It is not quite finished. A saw-mill is ready to operate. Steam engines run an electric generator for lighting and for mill motors, a two-drill air compressor and the saw-mill.

The mill is solidly constructed on a hill-side. A 12" by 15" jaw crusher discharges to ore-bins which feed to four heavy Tremaine stamps. These discharge to amalgamating plates. Below are two Overstorm concentrating tables, which can be used to separate the sulphides if required. In addition there are two Frue vanners, which will not be useful. The estimated capacity of the mill is 30 tons a day or more. It can be used economically to treat high-grade ore.

Adjoining Properties

The schisted zone has not been prospected at all outside the property of the Lake Fortune Mining Company. To the east it extends onto the Pontiac Abitibi property. The western extension is covered by a claim staked recently by the Crown Reserve Mining Co., who also hold a claim to the north of the Pontiac-Abitibi. To the north is the King of the North claim, also unexplored. The area of syenite porphyry and Temiskaming conglomerate to the southeast is held by Redmond Quain and associates of Ottawa, who have at present a party stripping and sampling.

Operations Fully Financed

The operations of the Lake Fortune Mining Company are now controlled and directed by Messrs. Alderson and MacKay of Montreal. The former owners, Messrs. Bonner and Goyer and associates, retain a substantial share in the ownership. Sufficient money has been subscribed by Messrs. Alderson and MacKay and some friends to develop the property fully to the stage of adequate production, and to build a modern mill of such capacity as may be required. This money is already in the hands of the Company's treasurer.

Ore-shoot on the edge of Lake Fortune, looking east. Along the water's edge and under water $200 ore is found. Shovel indicates dip of schist.

Mr. MacKay was at the property at the time of my visit. I wish to acknowledge gratefully his courtesy. The facts cited above are mainly what he has determined and the geological deductions with regard to the occurrence of the ore are his. Both he and Mr. Alderson are experienced and successful mine operators, and both have in unusual measure the rarer quality required for prospecting and preliminary development. They have the hearty support of the former owners, who remain their associates and will share the results of development. They are associated with a financial group well acquain-

tomed to mining investment and both able and willing to provide all the funds that may be required.

Now it is up to the property to make good. At present it is a prospect of unusual promise. Should that promise be fulfilled even in small measure, Quebec's first gold mine will be established. If a half of what is promised by the outcrop should be realized, that mine will be a big one. By this time next year these questions will be at least partly resolved.

PLATINUM SWINDLERS OPERATING IN CANADA

Reports of the finding of platinum in many of the mining districts of the United States have been creating a stir in "get-rich-quick" circles of the West. The discoveries, according to these accounts, are particularly rich in the States of Idaho and Washington. The value per ton of the ore on the dump, in the case of a Company with headquarters at Seattle, is something fabulous, according to the statements of promoters. A Victoria resident, who has been identified with the mining business for years, has been generously offered the chance of "getting in" in the ground floor for a mere $50,000; but he must act before the mill begins to grind out the wealth that is "on the dump." The gentleman who was asked to invest felt that he would have to receive more information before acting, and applied to the B. C. Bureau of Mines. He was shown recently published reports of the United States Bureau of Mines and the Bureau of the State of Idaho. Then it developed that many mining properties, publicly advertised as producers of platinum and the metals of the platinum family, had been investigated by the authorized officials of the United States Bureau of Mines and that the assay returns obtained by that Bureau have been negative.

It would appear, therefore, that the "game" which has been and possibly still is being played on the other side of the line is likely to be tried in Canada. The condition has been grappled with by the United States Bureau of Mines most energetically and effectively. Their representatives secured the samples and the assays of 44 ores which were represented by the promoters as containing platinum. These samples the U. S. Bureau of Mines had assayed carefully, but in no case did they find any platinum. These results they published side by side with the names and extravagant claims of the promoters. Thus one reads of a property, the subject of a prospectus claiming to contain ore running anywhere from 200 to 300 oz. of platinum to the ton, with the word "none" under the "platinum content" column of the U. S. Bureau of Mines Report.

In the face of this public exposure it might be thought difficult for the successful delusion of the public to continue. It is more than likely, however, that the official reports of the Mining Bureau of the States do not get the general publicity that their importance warrants, just as the reports of the Canadian Geological Survey of Canada, many of them of absorbing interest, do not reach the hands of all who might like to have them if they knew of their existence. Canadians, however, have much to be thankful for in the present instance, because the United States' Mining Bureau has given the warning, and has supplied the material that will effectively "kill" any effort to sell stock (or "units" as the promoters prefer to call them) in these fraudulent platinum flotations.

This serves to recall an episode in the mining history of British Columbia. It was in 1911 and 1912 that platinum was reported to have been struck on mining properties in the Nelson District. Excitement resulted. Many claims were staked and companies were proceeding to find the funds needed for the erection of mills for the extraction of the precious metal. A. G. French started the ball rolling when he announced having found platinum and metals of the platinum group in certain dykes in the vicinity of Nelson and notably in dykes of the Granite-Poorman Mine. He said also that he had evolved a process by which they could be economically extracted.

Wm. Fleet Robertson, Provincial Mineralogist, was called upon to investigate these claims and deals with them in the Annual Report of the Minister of Mines, 1912, outlining the circumstances above narrated, and detailing the steps taken by the Provincial Bureau of Mines to either prove or disprove the claims made by Mr. French Samples were obtained and forwarded to the leading metallurgical chemists of America and England. In all cases the results showed platinum "nil." The mining flurry, based on the assumed existence of platinum, passed away. It was unfortunate that it occurred at all, as there is no doubt that the district suffered the inevitable reaction. This, however, is casting no slur from the viewpoint of mining on the highly mineralized section of which Nelson is the centre. The developments of the past few years speak for themselves. No part of the Kootenays, least of all the Nelson district, needs spurious boosting to assist it to mining prosperity.

PERSONAL AND GENERAL

Mr. Minor C. Keith, of New York, who is interested in the Premier Gold Mining Co., has returned after a visit to the Premier Mine. He was accompanied by Mr. H. C. Price, consulting engineer. Mr. Keith is quoted as saying that the new tunnel of the Premier has passed the 600-foot mark, that it will be double-tracked, and that the new 1,000-ton mill will be constructed at its portal. Mr. Keith seems much pleased with the conditions and the future prospects of the camp.

Dean R. W. Brock was Canada's representative at the Pan-Pacific Science Congress held in Australia recently. He and other delegates inspected the Broken Hill and other mines in Australia and Tasmania.

Prof. H. E. T. Haultain has returned to his duties at University of Toronto after a few weeks in the Porcupine district.

Mr. W. R. Tonkin, mining engineer of Seattle, who formerly was interested in the Fish Creek Mine now owned by the American Mining & Milling Co., has returned south after some months in the Portland Canal District. He is one of the owners of the Bear River Group of claims. Mr. Tonkin states that the season now closing has been one of the most active in mining ever seen in the British Columbia northland and that the future of the Salmon and Bear River areas is assured.

Mr. G. B. D. Turner, managing director of the Indian Mines Ltd., has returned to Stewart and will spend the rest of the season at the mine.

NICKEL IN SPITZBERGEN

Nickel is reported to have been discovered in Spitzbergen. Mr. Carl Sjeber [illegible] to Trondhjem, Sweden, after a season's exploration in the islands. He has made no public statement of the size of the deposits or their exact location.

The man who wrote most wisely, said,
"Be sure you're right, then go ahead."
Might well have added [illegible]
"Be sure you're wrong before you quit." —Ex.

An Iron and Steel Industry for British Columbia

Victoria Chamber of Commerce Shows That Proposals of Coast Range Steel Company are Unsound, and Indicates a Probable Rational Solution

The Coast Range Steel Company Limited has been organized for the establishment of the iron and steel industry in British Columbia. Its chief promoter and the most ardent exponent of its cause is Mr. H. J. Landahl, who has worked on its behalf in London, Ottawa, Victoria and Vancouver. Recently he and his associates have been particularly active in British Columbia. They have obtained, through well directed and insistent effort, the support of most of the public bodies of the chief cities of British Columbia. One organization, however, has declined to back Mr. Landahl, viz., the Victoria Chamber of Commerce. This decision was reached, it is said, after careful consideration by a special committee. The report of this special committee has been published and is of interest because it differs so materially from the views publicly expressed in this Province on the question.

Following is the full text of the report:—

"Your committee, instructed by the president to investigate and report upon the projected enterprise of the Coast Range Steel Company, wishes to state as follows,

"The Coast Range Steel Company, promoted by H. J. Landahl, has for its object the establishment of a complete iron and steel plant at a cost of $15,000,000.

"The financial proposals are that the bonds of this company be guaranteed as to a one-third interest each by the Imperial Government, the Dominion Government and the Provincial Government. A propaganda seeking, and so far obtaining, the endorsation of various public bodies, particularly the boards of trade of this Province, has been carried on to press upon the Provincial Government the granting of the necessary bond guarantees, and the statement has been freely made that both the Imperial and Federal Governments have consented to contribute their share of guarantees. We have it on excellent authority that these statements are not in accordance with the facts.

"The Imperial Government has stated that it is prepared to consider guaranteeing one-third of the bonds, provided this guarantee shall be considered as a first mortgage on the entire properties and that any guarantees for the balance of the bonds both from the Federal and Provincial Governments shall be subservient to its own first charge.

"We learn from the officials of the Canadian Manufacturers' Association that the Dominion Government has stated positively that it is not prepared to guarantee any bonds issued for this enterprise, so that the entire financial burden would fall upon the Provincial Government. If it were possible to see any chance of such a venture becoming successful, it might be worth the most careful consideration, but in view of the actual facts, which apparently have not been ascertained by those whose money would be involved, namely the people of this Province, and in view of the facts set forth herein, we submit that our Chamber of Commerce should go on record as being entirely opposed to the proposition as set forth by the promoters of the Coast Range Steel Company.

"This particular proposal or scheme, in our opinion, should be condemned for the following reasons:

"It would appear from our information that the proposition is that, apart from the guarantees of the bonds which would be sold to erect the plant, common stock should be issued for the absorption of alleged iron ore properties and for properties containing the other raw materials which would enter into the production of the finished article. The affairs of the Company would be in charge of holders of the common stock, and there has been no suggestion of any security to prevent the paying of prices for these raw materials which would preclude any possibility of covering the overhead interest charge. It is represented to us that the quality of the coke produced on this coast is such as to make the profitable production of pig iron by the blast furnace process a matter of grave doubt as to its commercial practicability. The propaganda of the company does not show any estimate of the cost of the steel plant, including blast furnaces with blowing engines, ore yards, power plants, coke ovens with the facilities for producing by-products, blooming mills, billet mills, and finishing mills, together with all the subsidiary plants which would be required to produce such items as wire products, bolts, nuts, pipe, tacks, screws, etc., all of which must be contemplated by Mr. Landahl in view of the high capitalization of his company. It should be pointed out that plates, bars and structural material can be landed in British Columbia to-day, duty paid, from Belgium, at practically as low a cost as the selling prices at the mills in Montreal or Hamilton.

"The pig iron consumption in British Columbia is so limited that a plant such as proposed could take care of a year's consumption in less than one month's operation per annum, and the one essential to the profitable operation of a steel plant is volume of output. It has been stated to the Government that a large market is offering for British Columbia pig iron in California. Upon investigation it is stated that if the quality produced is equal to or better than that now obtained, and if the material could be sold to them in California at a price which they would deem satisfactory and which, in other words, would be lower than they are now getting, then they could use several thousand tons per month. We think the provisos would eliminate the possibility of obtaining a market in that state against such competition as the United States Steel Corporation, running its own boats from Birmingham, Alabama, to San Francisco, would provide, which would most certainly not be willing to forego its home market.

"The steel rail business in Canada is taken care of by the Dominion Iron and Steel Company and the Algoma Steel Corporation, which, by operating for short periods off and on during the year, are able to supply the entire Canadian market. The whole gross business of the Dominion of Canada is not big enough to take care of the supply of one sheet and plate milll, and the Dominion Iron and Steel Company, which built a plate mill some years ago under a Dominion Government bonus with a guarantee as to tonnage and price, has dismantled its plant and accepted $4,000,000 from the Government treasury to cancel the contract.

"The British Empire Steel Corporation, embodying the Dominion Iron and Steel Company, the Nova Scotia Steel and Iron Company and other plants, situated most advantageously for both the home market and export business, owning its own steamships and railways, has not been able to make a profit on its investment.

"The demand for the whole Dominion on structural steel and shapes has not been sufficient to warrant the es-

tablishment of a plant for this material in the Dominion, and none exists today. The tremendous variety of sizes and shapes and the capital investment required for the manifold number of rolls requiring to be changed constantly to meet the call for various shapes, demands such an investment of capital as the business of the Dominion has never yet warranted. Every successful industry has had to be built up upon its home market, and the market in British Columbia could be taken care of by such a plant in a few weeks' operation per year. The export business of finished steel product is always precarious. We could not hope to compete with Eastern Canada for markets east of Alberta, with our costs of transportation and production; and on sea-borne export trade we would have to compete with the ironmasters of Great Britain, with those of the United States owning and operating their own boats, and with Belgian material, which, as stated above, can be delivered at our doors at lower prices than the material could be produced for here or anywhere else in Canada. We understand that the Canadian Manufacturers' Association has made an investigation of this steel project and condemned it unequivocally.

"We are of the opinion that it would be greatly to the interests of this Province, however, if some means could be devised whereby production of pig iron on a small scale could be introduced, not necessarily as a profitable venture, but for the purpose of testing out the future possibilities in this direction. In this connection we may say that we are in touch with industrial parties at present located in the Province, who we beleive, have the facilities for doing work at small, if any, financial burden to the Government, and we propose to continue our negotiations in this direction in the hope of being able to submit to the Provincial Government at an early date some tangible suggestion in this regard.

"We have under consideration the utilization of some of our unused water power for the electro-metallurgic production of iron. We firmly believe in the great importance of our natural resources in iron and appreciate the effort of the Federal and Provincial authorities accurately to determine their character, extent and location. We hope that this work will be concluded as rapidly as possible and include a thorough investigation by special commission or otherwise, as these governments see fit, to advise as to the best way to bring these resources to account at the earliest possible date.

"We are of the opinion that economic conditions in British Columbia call imperatively for a greater use of our natural resources, of which iron is one of the most important. The successful production of pig iron in sufficient quantity and at a satisfactory price is the first step towards an iron industry, and from this initial step we may reasonably hope to see the following benefits accrue:

"1. The increase in number and kind of industries operating continuously, thus reducing the amount of seasonal unemployment.

"2. The attraction of a class of people to the Province for whom at present there is no opening.

"3. The retention of our young people in the Province by widening the scope of industry and multiplying the opportunities for employment."

Michael Faraday discovered the principle of the dynamo electric machine in the last century and without this knowledge, the whole art of electrical engineering could not exist. The value of electric power generated in Canada is $60,000,000 of which one-third is exported.

TOUGH-OAKES-BURNSIDE GOLD MINES

BY ALEXANDER GRAY

The Tough-Oakes-Burnside Gold Mines, Limited, capitalized at $5,000,000, will succeed Tough-Oakes Gold Mines, Limited, capitalized at $3,000,000. Judge F. H. Phippen of Toronto probably will be President; H. S. Denny, C. B. E. of London, will be Vice-President. Among the other directors will be A. Burt of London, England, and W. D. Wilson of Hamilton, Ontario. The par value of the shares is to be reduced from $5 to $1 and Canadians are to provide additional working capital. Of the $2,000,000 new capital, $1,000,000 will go to the Kirkland Lake Proprietary (1919) Limited, as the purchase price of three Burnside claims, held by Burnside Gold Mines, Limited. The other million will constitute the treasury. Not only are Canadians acquiring part of the treasury stock of the enlarged company, but they are taking options on some of the shareholdings of Kirkland Lake Proprietary (1919).

No doubt other details will be forthcoming shortly, as to the improved mining position at the Tough-Oakes and the possibilities of the Burnside areas. The more liquid situation to be created by the amalgamation, the share consideration conceded to the Kirkland Lake Proprietary, the participation of Canadians in what may be extricated from its embarrassments, will have more intelligent appreciation when the reports of the capable mining engineers in charge are made public. To justify the rearrangements and a market, the assumption is that enough encouragement has been met with underground at the properties involved to warrant optimism and increased activity.

It is entirely fitting to have the London interests in Kirkland Lake Proprietary effect closer contact with responsible Canadians. The success attending the Mining Corporation of Canada was attributable to the provision of "on-the-spot" administration. Otherwise the Townsite Mine of Cobalt might not so speedily have redeemed itself and been the basis of the merger of the Townsite, City of Cobalt, Lake and other properties. The Mining Corporation of Canada may be London-controlled, but it has a Canadian organization that commended itself to Canada and to international shareholders. A combination of London and Ontario capital, cicerone by Dr. J. Mackintosh Bell, brought the Keeley to the centre of the stage, where the spotlight does not detract from its charms.

Some of those who are not wholly blameless in the matter of the Tough-Oakes episode, now admit that a Canadian organization is essential. They sowed the wind and reaped the whirlwind, as it were. To liquidate certain outstanding obligations and to provide working capital for the Tough-Oakes, they had to sell their valuable interest in the Sylvanite. Thereby they enabled themselves to proceed to the exploration of the complicated Tough-Oakes faultings; but they had difficulty in finding enough ore to maintain the Tough Oakes on a continuous milling basis. Fortunately, however, the technical control and present executive at the mine have solved some of the besetting problems and the inference drawn from the creation of the new Tough-Oakes-Burnside Company is that now it has better prospects. London did not fare well with Tough-Oakes; Canada in co-operation with London may work to more profitable purpose. By bringing the Tough-Oakes Burnside back to the list of regular producers, Messrs. Denny and Thomas will render distinguished service to that section of Kirkland Lake

D. H. McDOUGALL'S RESIGNATION

There were heartfelt expressions of regret in the mining and steel producing districts of Nova Scotia when it was learned that D. H. McDougall, Vice-President of the British Empire Steel Corporation, had resigned. Sometime a prophet is *not* without honour in his own country and this is one of those rare occasions. Mr. McDougall grew up in Glace Bay among the working classes and though he far outstripped all his fellows in rising to positions of responsibility and trust, yet he never grew away from them. He remained one in sympathy with them, because he fully understood their aims and ideals in life. He passed through almost every phase of mining experience in his early years, after which he took up railway and engineering work.

When he attained to the second highest position in a great corporation he had helped to create, his fellow workers became justly proud of him. True, during most of the time since this corporation was formed, there have been acute labor troubles; but Mr. McDougall played a large part in helping to smooth them out. Now that "the winter of discontent is past," there is a warm feeling among all classes for Mr. McDougall, which is all the deeper because he was in the middle of the hurly-burly at its hottest.

In the recent labor crisis, the anxiety, and fear with which all looked forward to the final contest between Besco and its employees is still fresh in the minds of all. The confidence in the ability of Mr. McDougall to tide over the trouble, the tact with which it was done, and the short period of time in which the long drawn-out struggle was brought to a conclusion, have but accentuated his abilities. The peace that immediately followed and the rapid progress of the steel and coal trades have helped men to forget the bitterness of the past. Within two weeks, record outputs of coal were made, and these have been mounting higher since then. It seemed as if each district superintendent and mine manager had been waiting for the time to come when, untrammeled by labor troubles, unrestricted outputs could be given. Each vied with the other for first place. The No. 6 colliery district made the first large record, and was followed by Nos. 1 and 2, Nos. 11 and 24, and then Waterford. The increase for the month at Sydney Mines was more than 60 per cent above the best month of the year previous. Meanwhile the Acadia and Springhill Collieries, which had refused to come out on strike, were forging ahead and keeping pace with all others. The strike ended in the last week of July, yet August gave the largest month's coal output for the year. This would have been greatly exceeded in the following month, had the cancelling of contracts due to strike conditions not brought about dull trade. General Superintendent A. S. McNeil of the Cape Breton district fully expected to bring the output up to 400,000 tons per month, and this would have been done and exceeded had trade conditions remained favorable.

During the war period, and succeeding it, Mr. McDougall and his associates and assistants had a very difficult situation to cope with. The forming of the British Empire Steel Corporation has aided in settling some of the difficulties. Due to the policy laid down when the Corporation was organized, the condition of the collieries has been gradually improved. Equipment and development have kept pace with requirements. Plans for opening up new collieries have been made, and work commenced on some of these. Present conditions favor large outputs. Good ventilation systems have been put in at large cost, large fans installed, air courses opened up and carried into the coal faces. Permanent stone stoppings and overcasts have been built for the safety, health and comfort of the miner. The haulage systems have also been improved and extended, and the best methods known to modern mining engineering have been employed in mining coal.

The relation between the workmen and officials at the Sydney Steel Works is better now than for many years. All, or nearly all, are now working in harmony and trying to usher in a new day. This has had its effect on the outputs and new records have been made, and if trade conditions remain favorable it will sooner or later be realized fully that the co-operative spirit is the only one that will succeed in this old work-a-day world.

Mr. McDougall, as he retires, leaves the plants and mines in good condition, and the workmen better satisfied than for years past. We would have wished that Mr. McDougall could have remained to share the better conditions brought about by his own efforts; but having decided to retire from the active management of the Corporation, the *Canadian Mining Journal* wishes him success in all his future life and undertakings.—J. M.

"DICTATING PRICES"

The daily press of the United States and Canada, the dealers and the politicians are having much to say relative to the price at which gasoline should be sold and are setting themselves up as judges of a business about which they know very little. In this connection we believe the following editorial, which appeared in the August 30th issue of the *Oil & Gas Journal*, published in the United States, will be of interest:—

What would the farmers think, asks a student of the oil industry, if the grocers of the country were to unite in a demand for 80-cent wheat on the ground that there was an over-production?

It is easy to imagine the indignation of the farm bloc in Congress, the scathing satire with which they would refer to the "tail wagging the dog," the striking comparisons they would draw between the investment of the farmers, their risks and labors, and the comparatively small amount representing the grocer's stock of flour and bread.

Yet, this observer continued, is not that a practical analogy of the situation in the oil business? The producers with billions of dollars at stake, the refining branch with hundreds of millions invested, find their business jeopardized by the clamor of dealers whose own supply is dependent upon the successful operation of the producing and refining industries.

What other business shows the dealers attempting to dictate the price of product to those responsible for the production and manufacture? Do we hear of the automobile agencies throughout the country conducting a public agitation to compel the manufacturers to reduce the price of cars below cost? If they did and, by any possibility, through the aid of political pressure and public agitation, they could succeed in forcing their wishes on the manufacturers, how long would they have any cars to sell? No law and no agitation can compel men to do business at a loss, even if it were economically conceivable that they could attempt it.

Why, then, it is asked, should that sort of thing be forced upon the oil industry? The farmer can regulate his production by his acreage; the automobile manufacturer will not allow production to outrun the "saturation" point if it arrives. The oil producer has no such check on the discovery of new fields or sands and the refiner is likewise at the mercy of forces he cannot foresee, surely all the more reason why dictation of oil prices is more unreasonable and, indeed, impossible than in either the wheat or motor markets.

These facts are evident to all oil men in the producing and refining branches and should be equally plain to distributors and the consumers if they would stop to inform themselves and think it out. But the oil business has been for so long regarded not as a business but as a game of chance, as a target for criticism and abuse without the slightest basis of knowledge, that it seems almost impossible to attempt to secure a fair hearing for it in the court of public opinion, swayed by demagogic assertions by self-seeking politicians who are quick to take advantage of dissensions within the industry to further their own purposes.

This agitation against the oil business comes with all the less grace from the Senatorial, Congressional and Gubernatorial champions of the farmer suffering from an over-production of wheat. If they were only fair about it and would put themselves in the oil men's place they would be as indignant at the attempt to dictate the price of oil to the men who produce it as they would be if the grocers were to begin an agitation for fixing the price of wheat below cost.

SMELTING ZINC IN THE ELECTRIC FURNACE

The publication of Bulletin 208, "The electrothermic metallurgy of zinc," by B. M. O'Harra, associate metallurgist, is announced by the United States Bureau of Mines.

Zinc smelting is frequently termed a backward art, states the author of the bulletin. The term is hardly true, for great progress has been made in recent years in the design and in the thermal efficiency of the retort furnace, in the quality of retorts, in the recovery of zinc, and in the ability to treat more impure and complex ores. The fact remains, however, that the peculiar physical and chemical properties of zinc have delayed such immense advances — large smelting units, high recovery, low-unit costs, and ability to treat low-grade ores — as have been made in the metallurgy of lead and copper.

Much work has been done in an effort to find cheaper and more efficient methods of recovering zinc from its ores. Various methods have been proposed for smelting in the blast furnace. Some of these contemplated the production of zinc vapor and its condensation to liquid; others attempted to produce liquid zinc directly by smelting under pressure. It is now realized that fundamental difficulties render these proposals impracticable.

The electric furnace for smelting offers obvious advantages in the way of the efficient utilization of energy, large units, easy attainment of high temperatures, and the possibility of treating complex ores.

E. H. and A. H. Cowles first suggested a design for an electric furnace for the reduction of zinc ores in 1885. In 1900 several investigators started work upon various processes and had more or less success. The chief difficulty they encountered was the impossibility of obtaining more than a small amount of the zinc as liquid metal because most of the zinc vapor condensed as blue powder. Interest in the electrothermic metallurgy of zinc increased, until in 1914 and 1915 the problem seemed to be approaching solution. About this time the hydrometallurgy of zinc sprang into the limelight and a commercial process was soon perfected. This rapid development, perhaps aided by the war premium on the high-grade spelter produced by electrolytic deposition, distracted attention from electric smelting to some extent, though progress continued.

With the perfection and standardization of the electrolytic process has come a better realization of its limitations, especially the necessity for large-scale operation and the difficulty of obtaining high extraction. Because of these limitations the electrothermic metallurgy of zinc still has a field of its own and in fact promises to become a strong competitor of both hydro-metallurgy and retort smelting except under conditions highly favorable to the latter methods.

Because of the imperfections of the retort and electrolytic processes and the promise that the electric furnace offers in overcoming these imperfections, the United States Bureau of Mines, in co-operation with the Missouri School of Mines and Metallurgy, has undertaken a study of the electrothermic metallurgy of zinc.

IMPROVED VOLATILIZATION PROCESS FOR ZINC-LEAD SEPARATION

In connection with experimental work on modifications of chloride volatilization process, on which the United States Department of the Interior has for some time been engaged at the Intermountain experiment station of the Bureau of Mines, Salt Lake City, it is now announced that in several cases chlorides are left out of the ore entirely and oxides are volatilized. For mixed zinc-lead ores it is possible to so alter them by roasting that the volatile lead oxide can be removed from the ore by further raising the temperature, using a rotary kiln for this latter step of the work. Lead can be almost completely cleaned and even some of the silver removed from roasted zinc concentrate containing the usual small amounts of lead. This has already been shown by tests on a semi-commercial scale at Harbor City, Calif. It is believed that not only can this method be used with possible profit by the zinc smelters, but that it is entitled to favorable consideration as a means of concentrating ore. This work is about ready for larger commercial tests and the Bureau of Mines is now desirous of getting in touch with organizations who would be benefited by the use of this modified process and who possibly already possess all the necessary equipment required for the tests.

PROPERTIES AND USES OF TANTALUM

Pure tantalum, which can be produced from tantalite and manufactured into sheet, rod or wire, is quite soft, having a melting point next to that of tungsten, and is characterized by great ductility. Chemically, tantalum is exceedingly inert to the action of all chemical reagents. The only acid which will attack it to any extent is hydrofluoric acid. Present or possible uses include parts of wireless valves, dental instruments, filaments for incandescent lamps, analytical weights, etc. One of its most interesting properties arises from the fact that it can act as an electrolytic valve so that with a suitable set-up alternating current may be converted into a direct pulsating current, which can be used for charging storage batteries. Its property in this respect is similar to that of aluminium, but in the case of tantalum there is no problem due to the corrosion of the metal. The use of this metal for chemical equipment in the larger sizes will ultimately depend upon the cost at which it can be produced.

THE DUST PROBLEM

By H. S. SALTON

One of the great problems confronting mine, mill and factory management is that of dust. Any dust is a menace to health. An irritating, dust-laden atmosphere is the cause of more trouble than most persons realize. The health and efficiency, and hence the productive powers of the men are impaired, the wear and tear on surrounding machinery and property is increased, the protection against fire loss and explosion is lowered, the loss of men's time due to sickness and disease, caused by inhaling the impure air, is great and in many cases the saving of dust is a source of revenue because of the values carried in the fine material. Therefore, the firm owning and operating a plant in which dust is prevalent should protect itself against this menace by an investigation of conditions and the installation of suitable appliances for the elimination and collection of this dust.

Dust breeds disease; it carries germs; it affects the brain, lungs and eyes, and causes head-aches. Fresh, pure air is essential to good health. The management of one prominent plant claims that, since putting in a dust collecting system, the absence of employees from work has been reduced 85 per cent.

Some Sources of Dust

What are the sources of dust? They are so numerous that it would be difficult to enumerate them all, but we shall consider a few of the causes in mills treating the products of mines.

Dust emanates from the crushing and grinding machinery, and, in fact, wherever a dry process is used the surrounding air is sure to be laden with dust. When rock breakers are fed with ore direct from skips from the main hoisting shaft, the rush of ore over the grizzly results in a load of dust which, if the breaker is enclosed, remains in the air most of the time. Often there is a circulation of this air and the dust is carried away. This loss of value is of small consequence in the case of low-grade ore in contrast to the improved health and comfort of the attendants resulting from a dust-free atmosphere.

The undersize, when passing through the grizzly into the bins, also causes considerable dust. When skips or mine cars are dumped into bins and thence fed to the breakers, dust conditions are improved somewhat. The broken ore, flowing out onto the belt conveyors, throws off a good deal of dust, but this can be prevented a little by covering with a hood and an exhaust system. A spray is very effective, especially if a wet treatment is to be used where addition of water will have no ill effects.

All dry crushing mills are very dusty even when enclosed tightly; but they may be rendered almost dustless by exerting simple precautions. The casing can be connected by a metal pipe to a fan, but stop the fan for a moment and the dust arises in clouds. A fan is really necessary for the best working of such a machine, the protection of bearings and other machinery and the comfort of the attendants.

If belt-and-bucket elevators are used, both elevators and bins can be made almost dust-proof without much trouble. If built of wood, they should be double lined; if of sheet iron, they should be bolted or riveted with felt joints. If left undisturbed, all corners and small openings in conveyors, elevators and bins naturally become sealed by the dust collected within them, thus preventing the exit of dust to the plant. Chain-and-bucket elevators, if well constructed of plate and angle iron, make little dust and may be kept clean by means of a suction fan placed where they discharge. Pits in which the boot of an elevator is fixed should always be roomy and as shallow as possible.

Poisonous Dust

Dust is especially injurious where lead or zinc ores are being treated. The disease known as lead poisoning is appallingly frequent and the crippled condition of workmen whose systems have become affected with zinc dust and fumes is indeed pitiful. In the writer's experience, at one mill, treating zinc ores, the mill was in such a dusty condition that it was almost impossible to see more than a foot in front of one, and the working life of the mill men was very short, as paralysis of the limbs set in and the men were physically unfit for any real labor.

In many cases there is the danger of loss from dust explosions. Although not common in the metal mining industry, the subject is worthy of consideration, as the treatment of coal comes under this heading. To avoid dust explosions the proper and natural thing to do is to eliminate the dust. Thorough ventilation is of prime importance and naked flames should be avoided in plants where the production of dust cannot be prevented. Machines that may become overheated should be watched and the air around belts that may generate static electricity should be moistened by spraying or, as is most often practised its collection prevented by a wire to ground.

Processes that cannot be safeguarded effectively by the methods previously mentioned should if possible be conducted in a separate building, adequately protected from contact with surrounding property and with the machinery so arranged that it can be stopped and started from the outside.

Dust-Collecting System

Great care should be evidenced in the selection of a dust collecting system. As far as possible, have metal air trunks, steel plate exhausters, and metal dust collectors; and where settling chambers or dust rooms are used, these should be built of metal. In many instances the dust is in such a finely divided state that cloth strainers have to be used. Under this condition, if the dust is inflammable, it would be advisable to place the apparatus in a separate building with a system of sprinklers and a fire alarm, so that in case of fire, the chances will be in favor of a greatly reduced damage to property and perhaps to life.

In passing, one should mention the undoubted value of saving dust. In the mineral industry, dust is almost always worth saving, as its value is equal to, if not greater than, the ore being milled. Fines usually carry good values, and great care should be taken to keep the loss of fines down to a minimum; it is well worth a little trouble and expense. Their treatment is a little difficult, but a mixture of dust and raw ore has often been used to feed the furnace without any ill effect.

Details have not been discussed fully above; but the writer wishes to draw to the attention of those engaged in the management of industrial plants, the menace from a disregard of the dust problem. The destructive power of dust, as well as its possibilities as a source of revenue, should be considered. Study your dust problem and seek the advice of an expert. An efficient dust collecting and ventilation system is an essential apparatus in any dusty mill, from the standpoint both of sanitation and of economical operation.

INDUSTRIAL USES OF NICKEL

Sir Alfred Mond Outlines Post-War Development of Nickel Industry

Recently, in speaking to the shareholders of the Mond Nickel Co. at their annual meeting, the Chairman, Sir Alfred Mond, gave some interesting information about the Company's business. In spite of the trade depression, he announced, their financial condition had improved.

The demand for nickel, which had been at a very low ebb, had sustained a very considerable improvement during last year, an improvement which at present was maintained, and their turnover and deliveries had been satisfactory. Their products had been increased, and their works were well employed, but the prices which had been ruling, owing to a somewhat unrestrained competition from a good many sources, had been lower than almost any other period of the industry, and had counteracted to some extent the benefits derived from the larger sale and the larger production. Copper sulphate, of which they were the largest manufacturers in the United Kingdom, and which was the product which was chiefly exported to the Continent had suffered not merely from competition but also from severe fluctuations in the exchanges in most of the bigger export markets, such as France and Italy.

So far as the operating plants were concerned their Canadian colleague, Mr. Corless, recently visited England, and told them that as regards both the present and future of the mines and other plants there was nothing but satisfactory things to report.

New Uses for Nickel

The use of nickel for cooking utensils was on the increase. The firm of Messrs, Sankey & Co. had taken up the manufacture of nickel cooking utensils from nickel sheets rolled by their subsidiary company, Henry Wiggin & Co. Ltd., of Birmingham. The consumer had yet to be educated and to realize that whereas solid nickel-ware was more expensive in original outlay, it lasted for ever, required no repairs, and had great hygienic advantages.

Then, of course, the motor-car industry was beginning to awake to the fact that nickel looks better than brass, remains cleaner, and does not get tarnished, and we saw now cars with raditors, radiator coverings, and other fittings made of nickel-copper alloys. That was to spread. Then, again, the resistance wires, which were used for electric heaters and fires, which were becoming more popular, were made of nickel alloy and here again there was room for further development. These were a few out of a great many uses of nickel and nickel alloys, including the new alloy which Messrs. Henry Wiggin & Co. were putting on the market — "Corronil." There was no doubt a great demand for non-corrosive metal, which can be rolled, and is easily workable in a machine shop. The alloy, with a large proportion of nickel in it, had very high corrosion-resisting qualities. Their nickel mines were some of the largest and most important in the world, and all operations had been carried on smoothly and efficiently. As regards the refining works in South Wales, there again, results were very satisfactory. Relations with the workmen were harmonious, and they had every reason to be satisfied that those who had the more immediate charge of their very interesting, difficult, but cheap process of manufacturing nickel at those works were doing good work.

Nickel Coinage

The Chairman proceeded to draw attention to the changes which had taken place in the uses of nickel since the war. Previous to the war, he said, probably 50 per cent. of their nickel had gone to steel makers for armaments and 50 per cent. for the production of non-ferrous alloys and pure nickel products, whereas last year only 12½ per cent. had gone to the former and 87½ to the latter. That was counteracting the effect of the Washington Treaty on the manufacture of armaments. The use of nickel for coinage was increasing, many countries now replacing their paper currency with nickel. The Italian Government, for instance, had recently placed large orders for the supply of pure nickel coinage, this company obtaining the contract for the supply of the raw material. A similar contract had been obtained for one of the Baltic States. They had also supplied considerable quantities of nickel for other pure nickel and nickel-bronze currencies in various parts of the world.

He desired to say a word or two about their subsidiaries, Henry Wiggin & Co. Ltd., of Birmingham, and the American Nickel Corporation. Their company acquired all the shares of Henry Wiggin & Co., a very old-established and much-respected Birmingham firm, some time ago. In last year's report the directors stated that no dividends had yet been received on that investment. The firm, like most others, were hit by the sudden depression in trade. The board were well aware of the fundamental soundness of that business, and were not unduly alarmed at the temporary setback. In that view they were quite justified, because this business was now very well occupied, and was extending its operations, justifying entirely the anticipations which were formed. Nickel alloys were the special business of Henry Wiggin & Co., and they were also operating the rolling mills for making nickel sheets and pure nickel material of that kind. Their works were now well employed, and are turning out a very good product.

The Clearfield Plant

With a similar view of policy, the board took a considerable interest in a business in Clearfield, Pennsylvania, which had been laid out to manufacture a variety of nickel goods — rods, sheets, wires, and also their new alloy, "Corronil." They had recently had an opportunity of conferring with them, and two of their board — Mr. Owen Evans and Mr. Philip Mond — had been twice this year to America in order to study the situation on the spot. Here again they had a business which was not making any return at the present moment on the capital outlay, but which had great future value for the shareholders of the company. First of all, it gave an outlet for their nickel in the largest market for nickel in the world to-day, the American Continent.

Uses for nickel in that country would be very great. One of the most interesting developemnts in connection

with that side was the use of malleable bar nickel for turbine blades, with which that well-known firm, the Westinghouse Company, on that side of the water, were to-day carrying out very important experiments.

ECONOMICAL USE OF MINE TIMBER

That the consumption of timber in the mines of the United States has practically doubled within the past twenty years while the cost has in some districts increased three to five times is developed as the result of a survey of the mine timber situation just completed by the Department of the Interior, through the Bureau of Mines, in co-operation with the Forest Service. In many regions formerly well forested, it was found that the timber supply has dwindled until the cost of freight to the mines equals the cost of the timber at point of shipment. The object of this survey was to determine the cost and consumption of mine timber, and to study methods of selection, treatment, storage and use of mine timber, with especial regard to economies that might be effected, particularly by preservative treatment.

The Bureau of Mines has in course of publication a comprehensive bulletin, which points out to the mine operator ways in which he can reduce his timbering expenses and at the same time conserve the diminishing supply. The chief means available to mine operators for lessening timber expenses are greater care in purchasing by selective grading as practised in the lumber industry, rather than by the old method of purchasing by species; paying more attention to the benefits derived from peeling and seasoning, and proper storage, to prevent decay before use; and treating with a preservative those timbers which are placed in the principal openings, in order to prolong the life of the timber, and permit in many instances the use of less durable species in place of the more durable varieties.

PEAT BOG SURVEYS

Four peat bogs in Quebec were surveyed by A. Anrep of the Geological Survey during the field season of 1922. The results are reported in *Summary Report*, 1922, *Part D*, which includes maps of the first three.

The Sagamite bog, 13 miles north of Quebec city, is shown to contain recoverable peat equivalent to 481,000 tons of peat fuel. The ash content is rather high, but otherwise the peat is suitable for the manufacture of machine peat.

The Breakeyville peat bog is crossed by the Quebec Central Railway 13 miles south of Levis. The half west of the track is not deep enough for the economical use of a peat machine, but would provide excellent hand-cut peat. The part east of the track contains 847,000 tons of potential fuel, and is especially well suited for the manufacture of machine peat. The ash content is very low—about 5 per cent.

At St. Jean, 2 1-2 miles north of Breakeyville and 9 miles from Levis, is a small bog containing 225,000 tons of good potential fuel with a low ash content. It is suitable for a small mechanical plant.

At Ste. Thérèse, 20 miles northwest of Montreal, is a bog of 1,070 acres in extent, but too shallow for the use of a peat machine, that contained 460,000 tons of potential fuel. The fires of 1922 reduced his amount considerably. During the summer of 1920 an unsuccessful attempt was made to utilize this peat by cutting it by hand and then drying it in a draft of hot air.

The first three bogs described offer convenient sources of good fuel and will, doubtless, be put to use when the commercial manufacture of peat fuel becomes established.

THE PEAT INDUSTRY OF THE UNITED STATES

The annual report on the peat industry of the United States shows that it made substantial progress during 1922. The number of operating companies increased from 21 to 23, and the production increased almost 100 per cent. over that of the previous year, while the total value increased 52 per cent. Of the 60,680 tons reported, 1,040 tons was used as fuel, 1,893 tons as stock food, and the remainder as fertilizer. Thus the peat industry, though still of small dimensions, is growing satisfactorily.

DOES COMMERCIAL SECRECY PAY?

The contrast is so often made, and almost invariably to our disparagement, between the policy of secrecy generally pursued by British firms and the policy of openness said to be followed by firms of other nations, notably American and German, that it is difficult to dismiss it as merely imaginary, says "The Chemical Age." The latest reminder on the subject comes from Mr. J. A. Reavell, an engineer familiar not only with British but with French and American practice, who returns from the United States impressed with the frankness with which people over there discuss their business. Not only is their plant freely open to inspection, but the visitor is shown their costing sheets, the details of their organisation, their methods of soliciting business, their advertising schemes, and all the rest.

Rarely does a British visitor undergo such an experience without surprise. Why, he naturally asks, should the American business man be so open about his business while rivals at home are so close? How can he afford to give away so freely secrets so jealously guarded at home? The explanation is to be found in a totally different attitude of mind. What we insist on regarding as vital secrets of trade are no secrets at all in the States—it is doubtful, indeed, whether even here they are secrets except in name. For, whether one takes the manufacturer or the merchant, there is very little in either case with which competitors are not already familiar. But we keep up the pretence of knowing things that nobody else knows, while the American business man has frankly given it up.

The gain, we think, is on his side. When a dozen engineering or chemical firms decide to exchange plans, each member who gives something to the remaining eleven gets in return much more. Relatively to one another they remain on the same level; the only difference is that all are better informed, and the more capable, therefore, between them of upholding the industry in which all are engaged as against outside competitors. Here, the opposite policy is pursued. Between manufacturers, between merchants, between consultants, even between societies, there remains an astonishing spirit of suspicion. Each prefers to act in isolation, believing that by so doing he can best keep ahead of his neighbours. Which is really the better way? We are strongly inclined to think that the collective attitude in the end pays better than that of isolation. The doctrine of living too much to oneself often proves bad business as well as bad ethics.

NEW METHOD OF LEACHING COPPER ORES

Technical Paper 312. "Leaching nonsulphide copper ores with sulphur dioxide," by Charles E. Van Barneveld and Edmund S. Leaver, has just been published by the United States Bureau of Mines.

This process was devised to provide a cheap and efficient method for treating the so-called "porphyry" copper ores of the Southwest, generally containing both "sulphide" and "nonsulphide" copper minerals, mixed in such proportions that they can only be satisfactorily treated by a method that will concurrently recover both the sulphide copper and the nonsulphide copper. The importance of the matter may be judged by the fact that more than one-half the copper produced in a recent year in Arizona and New Mexico, amounting in value to $106,000,000, came from the so-called "porphyry" low-grade deposits.

It is thought by the Bureau of Mines investigators that the sulphur dioxide leaching process, developed by the Southwest experiment station of the bureau, in co-operation with the Miami Copper Company and the Arizona Copper Company, is suitable and commercially available for a wide range of the ores above described.

Summed up, the advantages of leaching with sulphur dioxide are as follows: The plant is compact and not expensive; there are no installation difficulties; power requirements are light. Operation is simple and easily controlled; there are no delicate adjustments or critical points. Percolation difficulties common to leaching are entirely avoided. Perfect contact is assured between the finest ore particles and the reagent; thus there is excellent utilization of the reagent, which is very cheap. In consequence the process may be extended to ores with so much acid-soluble gangue that they could be treated at a profit by ordinary sulphuric-acid leaching. The process is as applicable on a relatively small as on a large scale, and small-scale operation does not necessitate an undue increase in operating cost.

JADE, AMBER AND RUBIES IN BURMA

Burma is famous for its jade. The greater part of the jade of fine quality is exported to China, whose fondness for the apple-green tinted jade is well known. The production of jade from April 1, 1921, to April 1, 1922, amounted to 3,815,035 hundredweight, valued at 701,673 rupees ($226,346), averaging 5 cents a hundredweight (112 pounds).

Burma has only a small output of amber and that produced is not considered by experts to be as desirable as Baltic amber, being harder. It is found in clays of probably the Miocene age. There is little variety in the color, which is bright cherry yellow with a reddish tint that fades into a dirty brown. It is used in the manufacture of rosaries and Burmese ornaments. Little is exported save in the form of beads, which are pretty and effective but not generally popular even in Burma.

According to a British publication, next to petroleum rubies are the most valuable mineral product of Burma. Concerning their origin the author states:

"They are found in a variety of places — at Manyaseik, in the Myitkyina district; in the stone tract of the Sagyin Hills, in the Mandalay district; and in small quantities in a few other places. The only place, however, where the returns are really profitable is the Mogok area, about 90 miles northeast of Mandalay. The Ruby Tract proper, consisting of mines at work and those abandoned, extends to about 66 square miles. The area in which mines are in active operation covers 45 square miles."

The Burma Ruby Mines Co. has the sole lease to extract precious stones from certain areas in the Katha district, where they are at present found. The production in 1921 was 112,197 carats, valued at 691,209 rupees ($222,971).

A small quantity of sapphires and spinels are also mined. — Commerce Reports.

A RESPONSIBILITY OF THE BRITISH PEOPLES

General Smuts has been particularly eloquent in appeal to the reason and better feeling of the world. In more than one speech recently he has emphasized his view that the British Government is seeking to save the world from irreparable disaster. What is wanted in the world to-day is some of the spirit shown in South Africa since the Boer War. At the unveiling of a memorial to General Botha at Durban, General Smuts said: — "This monument is not only a monument to reconciliation; it is the Englishman's hand stretched out to the Dutchman in South Africa, and it shows that the conflict is passed for ever from our country. General Botha was one of those men whose work will be measured by the centuries...To-day, it is a great leader like General Botha; to-morrow it may be a great leader of English origin; but whatever it may be, let us hope we shall always have such sane and wise and faithful leadership." And the moral might well be pointed from another utterance in another part of the Empire. In a speech in New Zealand, Sir Harry Lauder is reported to have said that "unless the nations of the world get together, you will be bringing up your son to die just as my boy died. But I can at least see through the mist. The salvation of humanity lies in the unity of the great British Empire. The rest of the world does not know that we want them to be friendly with us. I am out for friendship. We can get it by substituting vision for vanity, partnership for petulance, and trustfulness for suspicion." — United Empire.

RESEARCH ON THE RAND

In a recent address to the Chemical, Metallurgical and Mining Society of South Africa, its president, Mr. F. W. Watson, dealt with the beneficial results of practical research work on the Rand. This work is carried on mainly in the laboratories, mines and mills of the large companies, and by them is regarded as a necessary and remunerative investment. Among the problems investigated have been the economical use of fuel in the boilerhouse; the sampling of supplies of all kinds, from soft soap to calcium carbide; the dust problem; the use of mine water in steam plants and in the mills; the use of mine timber and its preservative treatment; the quality and preparation of drill steel; and numerous phases of gold metallurgy. In a number of cases the results obtained from these researches have been of benefit to the whole world of mining men. Concerted action alone has enabled these Rand investigators to solve some of their problems, and the results have been made freely available to miners and metallurgists elsewhere.

The Yukon output of gold for the first six months of 1923 is 341,991 ounces, which is 12,887 ounces less than for the corresponding period last year.

THE MINING DISTRICTS

By THE JOURNAL'S CORRESPONDENTS

QUEBEC

An official statement to the shareholders of the Noranda Mines Limited gives details of the recent discovery made on the southerly claim of the company's property in the Rouyn district of Northwestern Quebec. The new find, which covers an area of approximately 800 feet in length by 300 feet in width, is considered to be the most important discovery on the company's property. This area consists of crushed and brecciated lava flows, which have been cemented and replaced by quartz, pyrites and carbonates. Visible gold is found over a considerable portion of the area, but surface trenching and samplings done to date indicate that ore of commercial grade will be confined to the fractured zones, where the alteration of the lavas has been greatest. A trench across a portion of the ore body has shown two sections, one giving an assay of $9.00 across 8 feet, and the other $15.00 across 15½ feet. An additional 5 feet of ore adjoins the latter section, from which assay returns had not been received. These two sections of ore are separated by 63 feet of material, carrying an average value of $2.25 a ton, and this gives a total average value of $5.00 across a total width of 90 feet. Fifty feet to the north a parallel trench has shown two sections, one carrying $4.80 across 11 feet and the second section $11.00 across 25 feet. It is understood that since the report was issued further work has been done, adding to the importance of the discovery. It has been decided to start diamond-drilling on the ore-body at once, and also to sink a three-compartment shaft

Stabell To Be Developed.—Those who have taken over the Stabell property in the Harricana district of Quebec have contracted for a shaft to a depth of 300 feet and also for 400 feet of drifting and crosscutting at the 300-foot level. A small plant has been installed. The schedule provides for the shaft reaching the vertical objective by New Years. Then the richer section of the shear zone as determined by diamond drilling will be tested.

New Staking and Assessment Regulations Mooted. The Quebec authorities are moving in the matter of the new gold-mining development. Transportation and postal facilities to the Rouyn district are to be improved and more work will be required if ground staked by prospectors is to be held.

Heretofore the holder of a prospector's license has been able to stake one 200-acre claim, on which he must do twenty-five days work the first year and twenty-five days during the second year, and thereafter the same on each fraction of forty acres. The new provision will permit the staking of five 40-acre claims on each license, but twenty-five days' work will have to be done on each during the first instead of the second year.

By this commendable arrangement it will be more difficult to retain ground without doing work. If prospectors are given better means of access to the Quebec gold fields, they must show their willingness to find something, instead of holding on until others find something.

It is understood the Prime Minister of Quebec has given these matters his personal attention, for developments are attracting attention and his desire is to promote constructive activity.

NORTHERN ONTARIO

Gowganda. — The Castle-Trethewey has decided to proceed with the erection of a mill. In order to finance the construction and to carry on operations until the property is producing, there will be issued $200,000 of preferred shares. These shares will bear interest at the rate of 7 per cent., and will be offered to shareholders at 80. They are to be redeemable at any time, at the option of the company, and probably will be paid off from the first available earnings. Ore reserves stand at 1,363,000 ounces, which is an increase of 640,000 ounces during the past year. Since this estimate was made, a vein has been found that shows a considerable amount of high-grade ore, which has not been included. During the year, production amounted to 53,000 ounces, which was obtained by hand sorting.

South Lorrain. — The Keeley financial statement as of August 31st shows quick current assets of $711,000, which consist of cash, government bonds and ore on hand and at the smelters. The Ontario government has purchased a piece of the No. 26 vein, which in one place showed a width of almost 5 feet of 7,000-ounce ore. The piece purchased by the Government weighs about two tons and is the most valuable single specimen of ore which the government possesses.

It is announced that the Lorrain Consolidated has provided for future financing from the sale of part of the treasury stock. The company has 1,000,000 shares still in the treasury.

Cobalt. — The Kerr Lake Mining Company has declared a dividend of 12½ cents a share, payable October 15th to shareholders of record October 1st. The Kerr Lake is financing the Goldale property in Porcupine, the shaft of which is now down 1,000 feet.

The Nipissing has declared a dividend of 3 per cent. payable October 20th to shareholders of record October 1st, and in addition has declared a bonus of 3 per cent. This will call for a disbursement of $360,000

During the month of August there was shipped from the Cobalt camp a total of 898 tons of ore, concentrates and residues. Of this amount 736 tons went to the Deloro Smelting & Refining Company in Ontario, and 162 tons to the American Smelting & Refining Company at Perth Amboy.

Kirkland. — Mr. T. E. Godson, Mining Commissioner, has adjourned proceedings in the tailing dispute brought against the Kirkland Gold by the Teck-Hughes company, as it is hoped that an amicable settlement may be reached. The Teck-Hughes was asking for an order to restrain the Kirkland Gold from depositing tailings on Teck-Hughes ground, and was also asking for damages in respect of the ground that had been covered. The question of tailings disposal is likely to be of increasing importance in Porcupine and Kirkland, and it is to be hoped that the Teck-

Hughes and Kirkland Gold may reach a private understanding. It would be an exceedingly unfortunate thing if damages were to be assessed, as some people have hoped they would be, on an acreage basis, as this would establish a precedent for future litigation. The Teck-Hughes is understood to be producing at a record rate, and it is stated that the output for the first half of September was over $60,000. The annual report for the year ending August 31st will be published shortly, and will show substantial increases in both production and profits. Ore reserves, which were shown last year at $1,183,000, will be practically doubled this year. Development work on the 1,100-foot level is understood to be giving better results than when the veins were first intercepted at that depth.

The Wright-Hargreaves has declared the regular quarterly dividend of 2½ per cent, payable October 1st to shareholders of record September 15th. This dividend calls for $68,750 and makes a total of $687,500 paid to shareholders to date. Production is being maintained at the rate of approximately $60,000 a month, but enlargements are being made gradually in the mill, and some time next year this output would be substantially increased.

Officials of the Montreal-Ontario state that good values have been encountered on the 450-foot level. At this point there are two veins, about 30 feet apart, and one of these shows a width of over 12 feet.

On the 800-foot level of the Tough-Oakes Mine, an ore-body is being developed that constitutes the most important discovery made on the property in the past several years. Over 100 feet of drifting has been done, with values ranging from $15.00 to $90.00 a ton, and the vein has a width of from 5 to 6 feet. This ore is being followed toward the Sylvanite line, which gives additional speculative value to the latter property.

Larder. — The Crown Reserve Company has purchased a 150 h.p. Diesel engine for its Larder Lake property. This will permit of more extensive development being carried on at the 550-foot level, and will also allow of work being carried on to a greater depth.

Painkiller Lake. — At a meeting of the Hattie and Beatty Gold Mines, held a short time ago, it was decided to increase the capital of the Hattie to $5,000,000 and to take over the Beatty claim. Shareholders of the Beatty will be given one share of the Hattie stock for each one they now hold. Of the $5,000,000 Hattie capital, 1,838,000 shares are outstanding, and 1,450,000 shares will go to Beatty shareholders, leaving 1,712,000 shares in the treasury. An option on 500,000 treasury shares has been given to Mr. W. W. Butler of Montreal, at 25 cents a share.

Porcupine. — The Nighthawk Peninsular Mines will sink a new three-compartment shaft, which will be about 250 feet east of the mill and 800 feet east of the present shaft. The location of the shaft was decided upon after diamond-drill holes had been put down. Every effort is being made to get the mill in shape so that operations will be started some time in November.

The Dome has declared the regular quarterly dividend of $1.00 a share, payable October 20th. It is understood that after this date the capital of the company will consist of 1,000,000 shares of no par value instead of the present capital of 500,000 shares of $9.00 par. There have been no recent developments of particular importance at the Dome, but underground work continues to yield satisfactory results. Production is at the rate of approximately $400,000 a month.

Tonopah Company Drops Options.—There is general regret that the Tonopah Company, with its experienced field forces has decided to abandon the two Kirkland Lake and one Shining Tree properties it undertook to exploit. The incident is not without a moral. King Kirkland capitalization was increased to $5,000,000 by the Jordan-Wettlaufer interests. Tonopah, after a try-out declined to go further. Its action in the matter should have an educational influence. Half the Shining Tree story has not been told. Duplicity on the part of some concerned did not aid the success of the undertaking, nor does it inspire a greater degree of faith in a certain type of promoter.

NOVA SCOTIA

"Bump" at Springhill.—Two men were killed in No. 2 Mine, Springhill, both being buried in coal thrown out from the face and sides by a "bump". It was a local disturbance, but about sixty feet of the track was thrown up, and a number of the timbers displaced. Springhill has been grappling with the problem of sudden strata movements for a number of years. The method of mining was modified to meet the dangerous and uncertain conditions. For a time it seemed that success had been obtained, but of late bumps have become more frequent and there is considerable anxiety among the workmen. The management of these collieries is very efficient, and has studied from many angles the question of sudden exertion of strata pressure. Having changed the method of mining to overcome the difficulty and having failed partially in its purpose, the management is ready to go still further if it is found necessary, and to introduce a new system. But it must be thoroughly demonstrated that the present method has failed and further modifications may be necessary before this is done. The quality of the coal from this mine is excellent and in great demand, and in order to keep the output up to demand the best mining engineers of Besco are working on the vexed problem of bumps.

Nova Sotia Miners to Decide their Own Status.—A Glace Bay lawyer representing the United Mine Workers in Nova Scotia together with National Officer Frampton went to Indianapolis to state the case of the miners and their views on remaining in the organization. President Lewis made it quite clear that the matter was largely in the hands of the miners themselves. He stated that they could either stay in or go out as they pleased. He would do nothing to coerce them, either way. If the laws of Canada were so constituted as to give no protection to the U. M. W. A. as a labor organization, then he would not fight against the law. The miners are free to choose their own course, but if they decide to stay in the union then they must understand that the laws of the organization must govern their action. A convention will shortly be held to determine what action will be taken in the matter. Outside of the U. M. W. there are the Russian Reds, the O. B.U., the I. W.W. and the Workers' Party of Canada, all of the same color so that there is little to choose among them.

Officials Inspect Plants.—Mr. Roy Wolvin, President of Besco, Sir Newton Moore and Messrs. D. F. Downe and Franklin have made a tour of inspection of the Steel Works and Collieries. Messrs. Downes and Franklin are both Americans, the former having been

President of the Lackawanna Steel Company for years. This company operated several coal mines for the purpose of supplying their steel plant. When the inspection is complete and a report made, changes in the executive will take place.

"Mecco" Rescue Apparatus Selected.—J. J. McDougall, Assistant General Manager of Acadia Coal Company, attended a meeting in Cape Breton at which the merits and demerits of several types of rescue breathing appartus were discussed. The "Mecco" was selected as being the most suitable for the Nova Scotia Collieries although it was openly admitted that each type of apparatus had its own advantages, which under different conditions might make it commendable. The "Mecco" is of British design, and like all other types is being constantly improved. All the colliery districts of Nova Scotia will be equipped with the same type of apparatus. This will enable the corps of one district to render effective aid in any other district should an accident occur necessitating outside help.

BRITISH COLUMBIA

Crown Granted Claims Now Open.—A list of British Columbia Crown granted mineral claims that have reverted to the Crown since 1919 for non-payment of taxes and now are subject to lease under Section 180 of the "Taxation Act", has been issued. There are more than 2,000 such properties and they are to be found in every mining district from Vancouver Island to the extremities of East Kootenay. When it is remembered that to secure a Crown Grant there must be an expenditure of at least $500 under the provisions of the "Mineral Act", some idea may be had of the large sum that has been spent on holdings that now have found their way back to the Crown. This, however, should not be construed as a reflection on the mineral possibilities of the Province, for there is no doubt that a large proportion have been relinquished by their owners because the capital necessary for the thorough exploration of their merit has been lacking.

In the Kootenays, especially in the Slocan District, and in the Boundary section there are many of these dormant Crown Granted Claims. For the reason that they have been to some extent developed, they have been shunned by the prospector. In the last few years there has been a marked change in the attitude of the prospector and the small operator. A considerable number of the old Crown Grants have been taken under lease, given a further test, and there are cases where the results have been surprisingly gratifying.

For the benefit of the mining man who may be looking for such an opportunity as is offered by these idle "prospects" it may be explained that the law sets out that:

"When a Crown Granted mineral claim has been absolutely forfeited to and vested in the Crown under the provisions of this Act it shall be lawful for the Gold Commissioner for the mining division in which the claim is situated to grant a lease thereof to any person for the term of one year upon payment of the sum of twenty five dollars and upon payment of a further sum of twenty five dollars to grant renewal of the lease for further term of one year commencing on the expiration of the former lease but for no longer period."

At the end of the two-year period, if the lessee's work has had good results, he may proceed to obtain a Crown Grant in his own name.

Stewart.—A company has been formed in Seattle, known as the Eldorado Gold Mining Co., of which T. V. Wilson is president, to exploit the Eldorado Group of mineral claims, situated near the head of the Salmon Glacier, Portland Canal district. Three veins have been opened up on the four claims this summer by means of tunnels and open cuts. It is said that about 150 feet of tunneling has been done and that when work ceased on the 10th of September the faces of each was in high-grade ore. It is proposed to instal a concentrating mill with a capacity of 25 tons of ore a day and the ore mined this year is to be shipped for testing in order to obtain information as to the type of mill required. An aerial tram approximately 3,000 feet in length is planned to carry the ore from the mine to the mill. The present intention of Mr. Wilson and his associates is to ship in lumber next February in order that the work on mill and camp buildings may be well advanced by the summer.

Samples of striking ore have been arriving at Stewart from a number of comparatively new stakings. Some from the main vein of the Comstock Group, Texas Creek, are almost solid galena, with some grey copper and iron; others from a group of claims near Tide Lake, are composed of iron pyrites running about $8 in gold and, where there are quartz stringers, going as high as $200; and there are some specimens of steel galena from the Sunrise Group, August Mountain, near the head of Salmon Glacier.

Upper Peace River.— John D. Galloway, resident mining engineer at Hazelton, is visiting the Peace River country to inspect a number of mining properties. Among others he is looking over the Mount Selwyn Gold Claims, described as a large deposit of free-milling gold-quartz. Eastern Canadian capitalists are arranging for a test of 200 tons of the ore.

Lillooet.—The Whitewater District, northeast of Lillooet, has good prospects of developing into a fruitful mining field according, to W. A. Davidson, who has been opening up the Province claim. This adjoins the Windfall No. 1 and is under option to A. B. Trites, who is expected to take up the option. A tunnel has been driven for a considerable distance on the Province and while the main body of ore has not yet been struck, the indications are satisfactory.

Trail Ore Receipts.—Ore receipts at the Trail Smelter, for the week Sept 1st to September 7th totalled 3,046 tons. This brings the aggregate for the year up to date to 301,302 tons. The detailed shipments for the week follow:

	Tons
Alamo, Alamo	94
Bell, Beaverdell	44
Company Mines	2,319
Knob Hill, Republic Wn.	63
Lone Pine, Republic Wn.	162
Quilp, Republic Wn.	151
Silversmith, Sandon	141
White Water, Retallack	72
Total	3,046

Pioneer Metallurgist Dies.—E. H. Wedekind, for many years a resident of Spokane, died in California some weeks ago. He was the first superintendent of the Trail Smelter after its construction by F. Augustus Heinze about 28 years ago. Later he was engaged in mining operations with Spokane as headquarters. Over fifteen years ago he left for Nevada and other southwestern districts and San Francisco became his home.

Institute Meeting At Trail.—The British Columbia Division of the Canadian Institute of Mining & Metallurgy will meet at Trail on October 17th. The papers to be presented include: "A Symposium by Department Heads on the mining and metallurgical Practice of the Consolidated M. & S. Co." "Mining and Smelting operations at Anyox." by L. R. Clapp. "Recent Mining and Metallurgical Developments at Britannia", by W. M. Brewer; "The History and Progress of Mining in the Kootenays", by S. S. Fowler; "Undiscovered Mines of British Columbia", by Dr. W. L. Uglow; "Publicity and the Mining Industry", by C. M. Campbell; 'Small Scale Mining Operations and their Problems", by A. G. Langley; "The General Geology and Ore Deposits of the Grand Forks, Greenwood, Osoyoos, and Similkameen Mining Divisions", by P. B. Freeland; and "The Sulphur Industry", by F. W. Guernsey. Those attending will be given an opportunity to inspect the Trail Smelter.

Domestic Coke at Fernie.—The Crow's Nest Pass Coal Co. of Fernie and Michel is reported to have succeeded in producing a form of coke which will burn freely under a low draught such as that of an ordinary household furnace or kitchen range. It is said that this new fuel is made by partially treating the coal in the coke ovens; in other words by leaving incomplete the process used in the manufacture of metallurgical coke. The coke thus made is reported to be dustless, to burn readily, and to give good heat. John Todhunter, superintendent of coke oven operations at Michel, is confident that the fuel will become popular.

ALBERTA

The Drumheller Strike.—The trouble between employers and employees of the Drumheller Collieries is reported to be nearing a settlement. The men have decided to return to work and to submit the dispute to an independent tribunal for adjustment. Hon. James Murdock, Federal Minister of Labor, is expected to be named to arbitrate and his decision will be binding on both parties. William A. Sherman, president of District 18, U. M. W. of A., has been busy for several weeks in an effort to get the men back to work It was the decision of the U. M. W. of A. that the miners were violating their agreement with the Western Coal Operators' Association in walking out and, when they refused to return, the charters of the U. M. W. of A. Locals at Drumbeller, which were involved in the strike, were revoked. It was at a mass meeting following this announcement that the men agreed to arbitration. The men charge discrimination against certain men, notably James Conroy, who was employed at the Higrade Mine, and claim also that they have the right to establish an O.K. list system whereby all miners hired would have to obtain a slip from the local union before going down a pit. The legality of this propesal will have to be considered.

New Colliery Project.—The Alberta Carbon Coal Co. Ltd. has been formed for the exploitation of 2,640 acres of coal lands in the Carbon District, twenty miles west of Drumheller. The seam to be developed is reported to be five feet wide and to be capable of producing some 10,000,000 tons of coal. The company is capitalized with a share capital of $500,000 and $100,000 first mortgage eight per cent gold bonds. H. Ransford is the president and W. P. Hinton, former general manager of the G. T. P. is a director.

Extension of $7.00 Freight Rate to Ontario.—As a result of a discussion between Premier Ferguson of Ontario, and Sir Henry Thornton, of the Canadian National Railways, it has been announced that 10,000 tons of Alberta coal will be transported to Ontario at the rate of $7 a ton. This concession, however, extends only to the end of October. The coal is to be distributed by the Province to such dealers and municipalities as make application to the Minister of Mines of Ontario while it lasts. A survey shows that Ontario has so far received 48 per cent. of a normal winter's supply of anthracite and 120,000 tons more than was on hand at this time last year. With the resumption of work at the American mines no serious shortage is anticipated.

This action can only be considered as an emergency measure. In a recent statement J. M. Dalrmple, vice president of the C. N. R., said that the tariff on coal from Alberta to Ontario points had been advanced to $12.50 a ton. He explained that a limited amount had been carried at $7 a ton for experimental purposes. The period fixed having passed, the rate had been placed again on a commercial basis. Another railway official was quoted as saying that Alberta coal could not hope to compete in Ontario with the Pennsylvania product because of the long haul and that, anyway, it had not proved a satisfactory substitute for the anthracite.

Judging from the attitude of Jesse Gouge, president of the Western Canada Coal Operators' Association, the hope of finding a permanent market in Eastern Canada for Alberta coal has not been abandoned. He says that negotiations are afoot for low freight rates on western coal after January of next year, that the experiment of shipping Alberta coal to Ontario was successful, as a repeat order came for every car dispatched, and that with fair rates, — anything from $7 to $9 a ton, — —Alberta operators could compete. He said that $9 would be the maximum, and $7 the best, and anything between the two would be welcome.

R. M. Young, commissioner of the Western Canada Coal Operators' Assn., declares that there is no intention to drop the fight, notwithstanding the geographical difficulties and that, sooner or later, the Association will get what is wanted.

THE NATURAL RESOURCES INTELLIGENCE SERVICE

A new catalogue of publications, just issued by the Natural Resources Intelligence Service, shows a number of useful maps, reports, and pamphlets, which that organization has prepared for the information of the investor, for the assistance of those engaged in commerce and industry, and for the guidance of the prospective settler. Economic maps illustrating progress along agricultural, commercial, and industrial lines; geographic maps of Canada, also the various provinces and districts; and interesting reports based on investigations made by the Service, comprise the collection of several hundred publications, that has been published to date.

The Service is a branch of the Department of the Interior, whose function it is to provide a central bureau of information respecting Canada's natural resources — a need to which public attention has frequently been drawn. Its work embraces a very broad field, necessitating the consolidation of much data gleaned from the evidence of explorers, corporation records, scientific and technical journals, and the reports of enquiries carried on by special commissions, universities, and other agencies. As the gathering and assembling of such information is only a means towards an end, it must be put into such form as to shed light upon the practical problems of development enterprise. Consequently much of the data is recast and

transferred to standardized maps, reports, and pamphlets, which enable related groups of facts to be furnished with the least possible delay.

Special importance has been attached to the preparation of geographic and economic maps, as a well-designed map is the most effective method for recording many classes of information which if handled in any other manner could not be studied with the same ease or effect. For instance a series of maps will convey more quickly and clearly than fifty pages of text, a correct appreciation of the distribution of Canada's resources, the main features of the coal situation, the problem of marketing the wheat crops of western Canada, or opportunities for establishing a new industry. As a consequence the Service publishes regularly a standard set of geographic maps, a series covering the land situation in the Prairie Provinces, Resource Maps of the Dominion and numerous publications along similar lines, as set out clearly in the catalogue of publications, just issued and obtainable on request.

Research in the United States

United States Federal and State Governments appropriated $57,000,000 for research in 1919-20.

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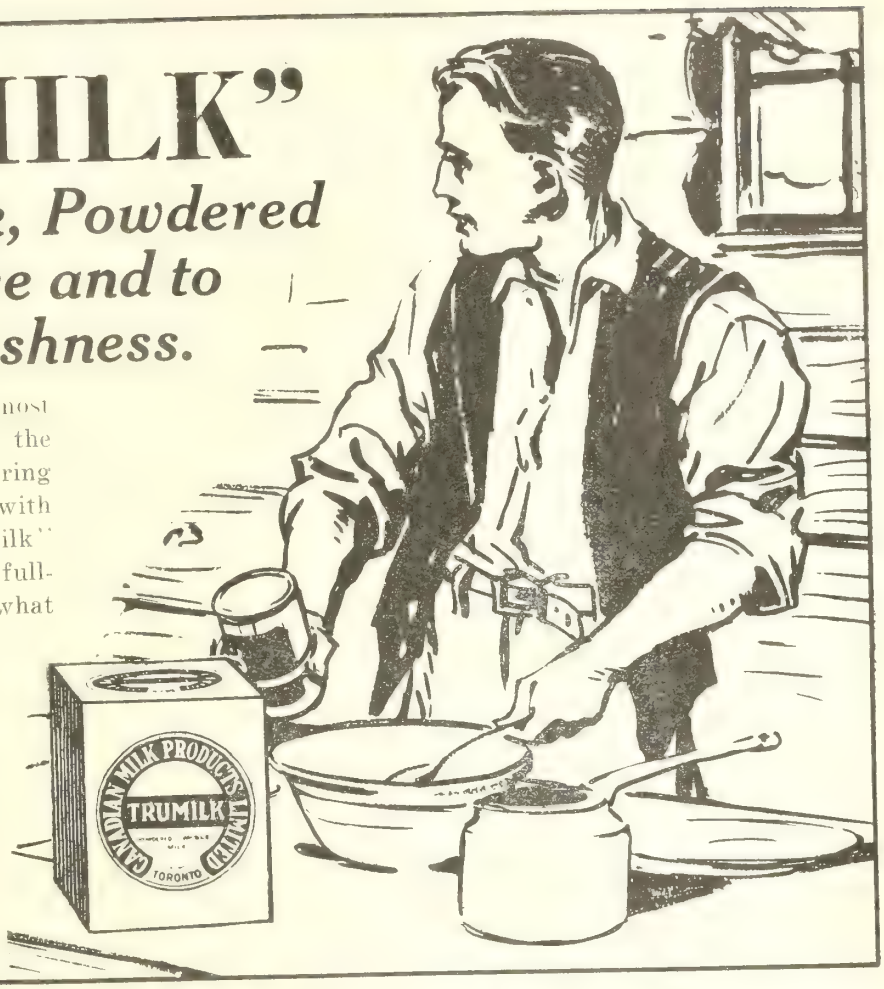

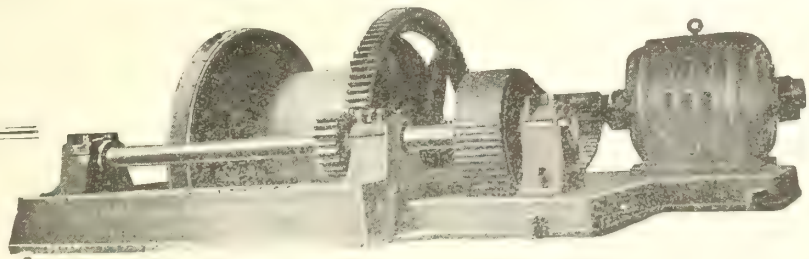

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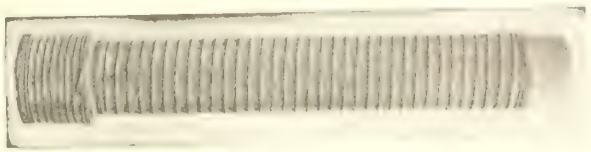

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SIX MONTHS AFTER STAKING. At the expiration of six months from the date of the staking, the prospector, to retain his rights, must take out a mining license.

MINING LICENSE. The mining license may cover 40 to 200 acres in unsurveyed territory. The price of this license is Fifty Cents an acre per year, and a fee of $10.00 on issue. It is valid for one year and is renewable on the same terms, on producing an affidavit that during the year work has been performed to the extent of at least twenty-five days' labour on each forty acres.

MINING CONCESSION. Notwithstanding the above, a mining concession may be acquired at any time at the rate of $5 an acre for SUPERIOR METALS, and $3 an acre for INFERIOR MINERALS.

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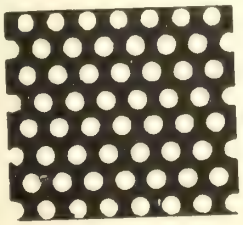

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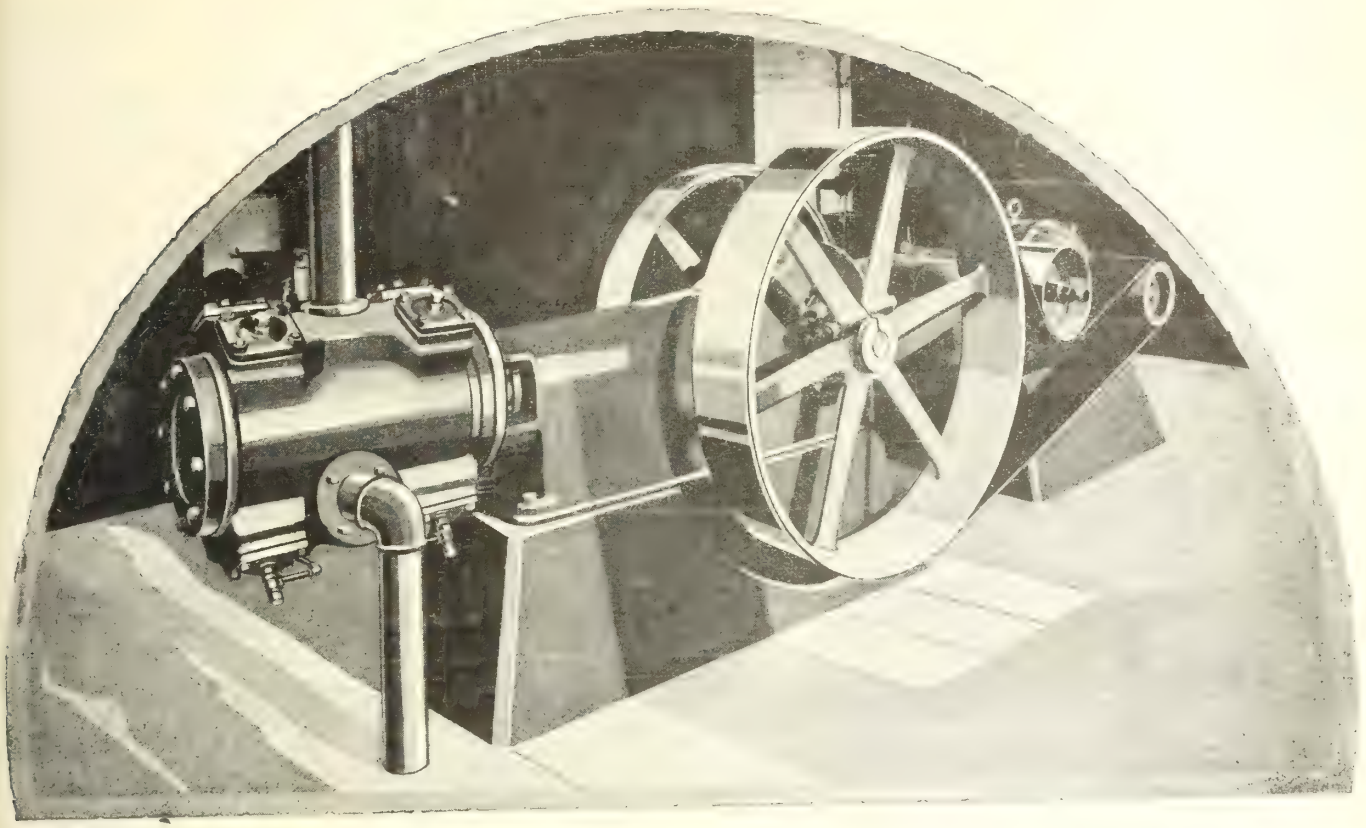

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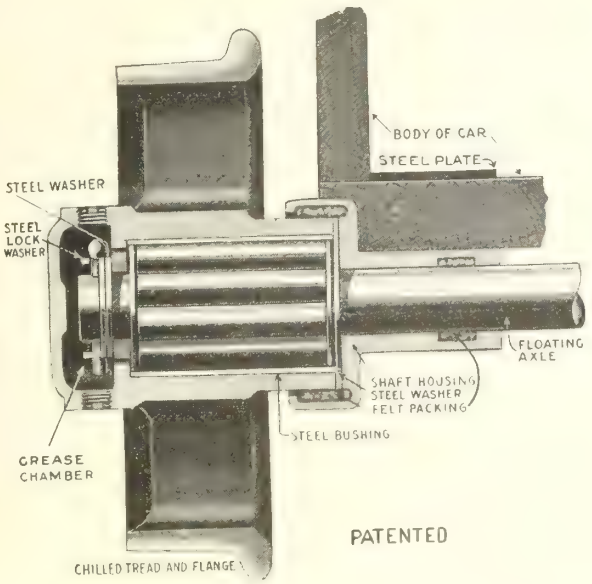

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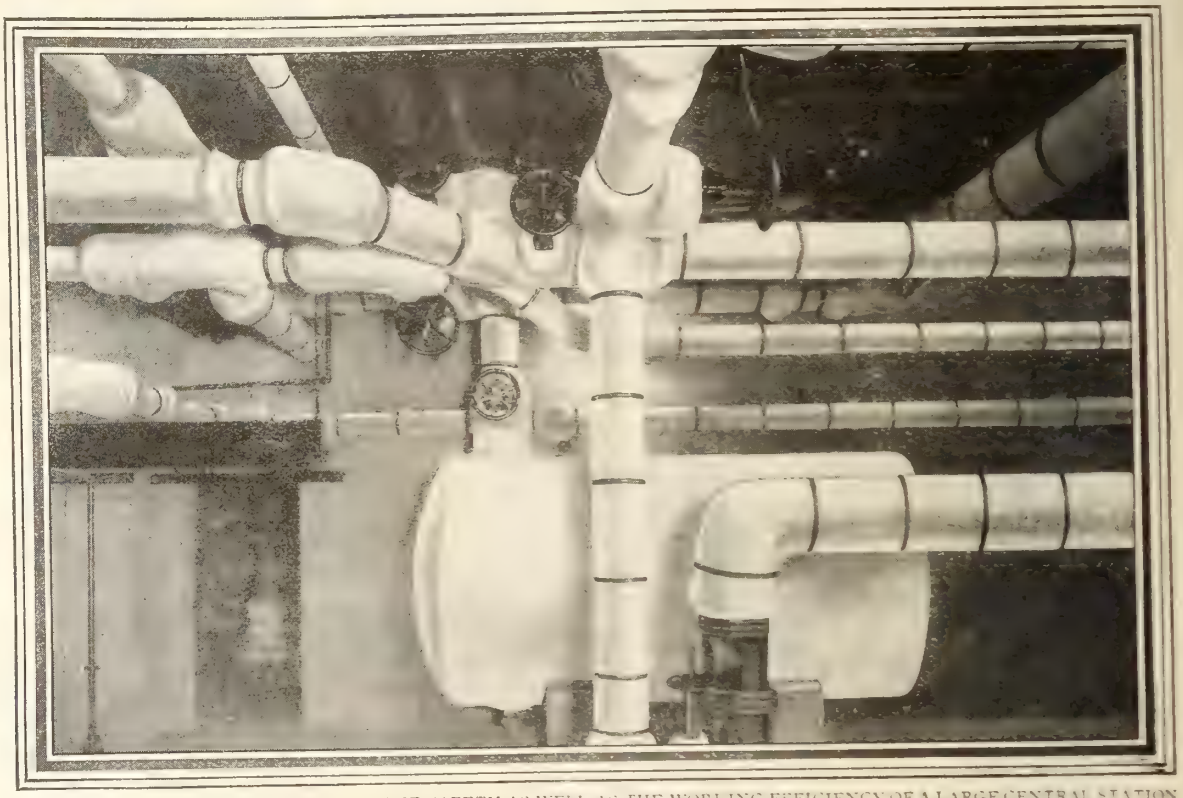

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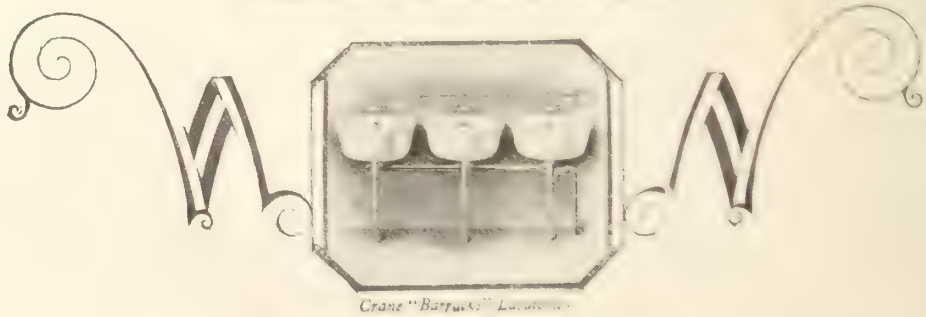

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Ontario's Minerals

PROVINCE OF ONTARIO

Hon. CHARLES. McCREA, Minister. DEPARTMENT OF MINES *Thos. W. Gibson*

Mineral Areas

Ontario, with its 407,262 square miles, contains many millions of acres in which the geological formations are favourable for the occurrence of minerals 70 per cent of the area being underlain by rocks of pre-Cambrian age. The phenomenally rich silver veins of Cobalt, Gowganda and South Lorrain occur in these rocks; so also do the far-famed nickel-copper deposits of Sudbury, the gold of Porcupine and Kirkland Lake, and the iron ore of Magpie and Moose Mountain mines.

Economic Minerals

In addition to the above, practically all economic minerals (coal and tin excepted) are found in Ontario: — actinolite, apatite, arsenic, asbestos, cobalt, corundum, feldspar, fluorspar, graphite, gypsum, iron pyrites, lead, mica, molybdenite, natural gas, palladium, petroleum, platinum, quartz, salt, talc and zinc. This Province has the largest deposits on the continent of talc, feldspar, mica and graphite.

Building materials, such as ornamental marble, limestone, sandstone, granite, trap, sand and gravel, lime, Portland cement, brick and tile, meet every demand.

Mineral Production

Preliminary returns show the output of the mines and metallurgical works of the Province for the year 1922 to be worth $62,202,169, of which the metallic production was $38,190,711.

The following figures show the growth of Ontario's mineral industry by five-year periods since 1891 when a Bureau of Mines was first established.

Year.	Value.	Year.	Value.
1891	$4,705,672	1911	$41,976,797
1896	5,235,003	1916	65,303,822
1901	11,831,086	1918 (Maximum war output)	80,308,972
1906	22,388,383	1921	48,128,387
	Dividends.		

Dividends and bonuses paid to the end of 1922 amounted to $28,096,699 for gold mining companies, and $86,238,185 for silver mining companies or a total of $114,334,884.

Mining Regulations

A miner's license costs $5.00 per annum, and entitles the holder to stake out in any or every mining division three claims of 40 acres each. After performing 200 days' assessment work on a claim, patent may be obtained from the Crown on payment of $2.50 or $3.00 per acre, depending on location in unsurveyed or surveyed territory.

Assay Office

The Provincial Assays Office at No. 5 Queen's Park, Toronto, is maintained by the Department of Mines for the free identification of minerals, free assays under the provisions of the Mining Act of Ontario, and also for general assay work as per the Schedule of Charges which may be obtained on application.

Temiskaming Testing Laboratories

The Department maintains, at Cobalt, an ore sampling and testing laboratory which is now prepared to receive parcels of gold ore from 100 pounds upward, and after sampling and assaying the same to pay to the shipper the value thereof, less treatment charges. The purpose is to afford a market for ores extracted by prospectors and others in developing their mining claims, enabling them to obtain funds which they can use for further work and to report on the most satisfactory method of treatment. Fuller information may be obtained on application to the Manager, Temiskaming Testing Laboratories, Cobalt, Ontario.

Publications

For list of publications, illustrated reports, geological maps and mining laws, apply to

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Deputy Minister of Mines,
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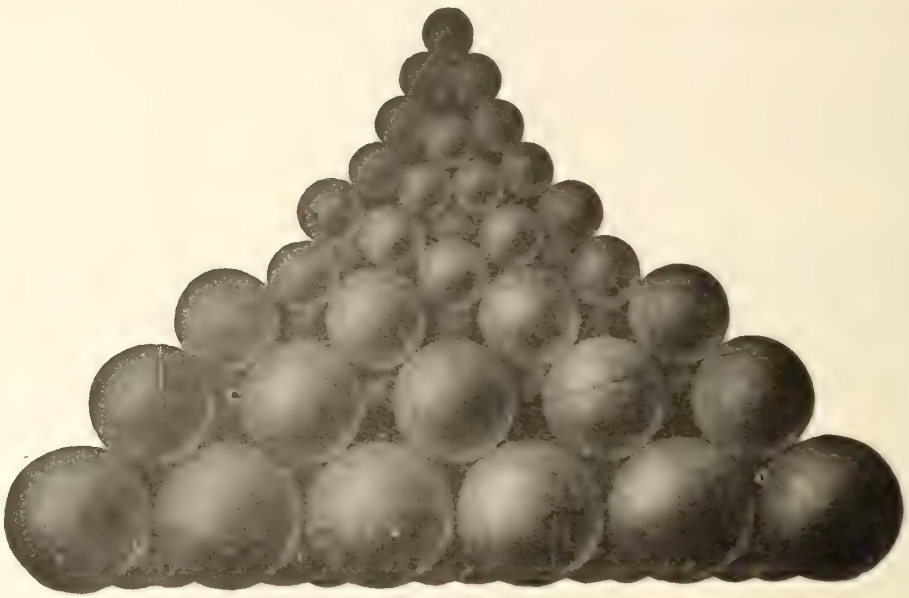

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CANADIAN MINING JOURNAL

PUBLISHED WEEKLY

Devoted to the Science and Practice of Mining, Metallurgy and the Allied Industries; and more particularly to their progress in Canada

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:-: EDITORIAL :-:

A TRUST

Last month one of the syndicates operating in the gold district of northwestern Quebec paid $2,000 into the provincial treasury on account of the tax on mining claims of 50 cents an acre due six months after staking. The syndicate has spent several times this amount in prospecting its claims during the season now drawing to a close, with results that well warrant this further expenditure. They have paid the tax cheerfully, convinced that they will discover sufficient gold on the land so held to recoup their total expenditure many times over.

Under the present administration of Quebec's income from its mineral lands, $1,800 out of this $2,000 will be spent for purposes other than mining; only $200 will be spent for the upkeep of the Bureau of Mines, for geological surveying, for roads into new mining camps, for trails to assist prospecting, for the maintenance of recording offices and for the innumerable additional public services that stimulate, aid and direct mineral development. Is this fair? We put the question to those responsible for formulating the policies and administering the laws that govern this expenditure.

The case cited is typical of dozens of others. The province will derive this year a handsome revenue from its new gold area. Those who hold claims are confident, not only of discovering payable deposits on their land, but of the good faith of the provincial Government. An adequate transportation service is required, not only to aid the intensive prospecting that must precede most discoveries, but also to assist in the underground development of these properties. Private owners have demonstrated their faith in the district by large expenditures. Part of their money is now held in trust by the Government as taxes. This tax has been levied, not on a going concern such as an operating mine, but on raw prospects. It would be a gross breach of this trust were the money spent otherwise than on roads or other facilities that will aid the prospective mines to reach the stage of profitable operation.

We are confident that the Government authorities in Quebec require merely to realize these facts in order to ensure that appropriate action will be taken. For almost a whole generation there has been no marked advance in the province's mineral industry, apart from the gradual and highly satisfactory growth of asbestos production. Consequently the legislators at Quebec are not accustomed to the idea of fostering and aiding a new mineral development; they have seen only evanescent "booms" during their régime; to watch the advent of a new mining camp is a new experience.

The first season's work indicates that there will be not one, but several gold mines in northwestern Quebec. Until these mines become established upon a paying basis, and thereby become liable to taxation like any other profit-making concern, it is incumbent upon the Government at Quebec to return to the district, in the form of roads and other facilities, at least the equivalent of the sum collected from it in taxes.

FIRE PREVENTION

This is fire prevention week — and likewise the anniversary of the conflagration that swept along the Temiskaming and Northern Ontario Railway last year, destroying Haileybury and making thousands homeless. The fire rangers have been withdrawn for the season — whether prematurely or not this year, we are unable to say. There are already some press dispatches telling a story of slash-burning such as preceded last year's fire. We trust the situation is, this year, well in hand.

Fire Control, published by the Department of Insurance in Ottawa in the interests of fire prevention, prints a "Fable for Builders" in its current issue, which applies equally well to lumbermen, Government officials, prospectors, settlers and any and all whose negligence with fire might endanger the lives of others. Here is the fable:

"Last summer a Good Citizen of a certain town, not over a hundred miles from almost everywhere, built a wooden house for a woman and her children. He built the chimney of brick because he had to do so. The chimney was able to stand alone so he did not have to prop it with wood. But the floors of the house would not stay up without props. The Good Citizen saved a dollar by using the chimney as a support for the floors. He nestled the ends of the floor joists nicely into the brick of the chimney. He then covered up the job and got his money.

"The rains fell and the winds blew in the most Biblical manner, and winter came after its usual fashion. The chimney settled a little and there was a tiny crack.

"One morning the woman woke up with fire all about her. She tried to get to her children. If she got to them, no one ever knew it. The Good Citizen

who built the house was not arrested for manslaughter. He is still building other houses of the same kind for other women and children.

"He makes his living by it."

SAFETY IN GOLD MINING

To the first well informed traveller in an unexplored land belongs the privilege of scanning its hillsides for evidences of mineral wealth. Some of the world's outstanding mines owe their discovery to so simple a search. Even at this date, when the larger part of our globe's land surface has been subjected to a close scrutiny by the geologist and the prospector, there remain a few vast tracts whose hillsides remain to be seen by a mining man.

Such an area is now being explored in central Africa, the present and prospective mineral belt extending through the eastern part of the Belgian Congo, across the equator into the southern Sudan, on the Nile watershed. We quote today on another page a brief description of this area by Mr. Robert Williams, who is concerned in directing its exploration and mining development. The vast scale of both the exploratory and the subsequent mining operations, and withal the simplicity and directness of the principles upon which the plan of action is based, induce one to adopt for a moment the continent-wide, or world-wide, point of view which alone can make such an undertaking successful.

Mr. Williams is fortunate in having gained his experience in mining on the vast reefs of the Rand. In addition, he was pupil to that master builder of industries and Empire, Cecil Rhodes. Consequently he was well prepared to map out a plan of campaign for the development of the Belgian Congo, when the first explorers brought back word of copper ore abundantly available to the natives and rumours of other mineral riches. He secured the coöperation of British investors with the Belgian owners of the land and with the aid of the requisite technical men located the ore zones, proved their size, built railways, opened a colliery, established smelters and arranged overseas markets, all within a marvellously short term of years. This was in the Katanga field. The cycle of events will be repeated further north, in British territory, provided the mineral resources disclosed by the present prospecting warrant it.

The copper ore of the Katanga is not only found in vast quantity, but is unusually high in grade. Already the smelter at Elisabethsville is a notable source of the world's supply of copper, and its operations are only well begun. The Katanga seems destined to share with the United States and Peru the distinction of providing copper for the world at large. If its reserves of high-grade ore should continue to increase as during the last few years, the mooted world shortage of copper and the consequent high prices will be postponed indefinitely.

Last year the phenomenally rich uranium ores of the Katanga captured the world's market for radium at one swoop. The thousand-mile haul to the sea board had little effect in reducing the value of the ore. In a day, almost, the United States was robbed of what had seemed a secure monopoly of the world's radium supply.

It will be interesting to note what other metal central Africa will succeed in adding in large measure to the world's output. Tin is being produced already, and the output of cobalt might possibly grow to such dimensions as to reduce Canada's predominance in its supply. None can tell what additional treasures will be disclosed during the next few years.

Meantime it is highly satisfactory to know that the larger part of Canada's new mineral development is of such a nature as to be unaffected by the output in other countries. Most of the growth is in the gold and silver fields. It will be a long, long time before there is any glut in the market for gold, and the prospects for silver are bright. With regard to the base metals, we cannot hope to do a great deal more than supply our own needs, with a modest amount for export. If the slow process of discovery resulting from the soil and forest growth covering most of our mineral areas should allow us to develop mines of copper, lead and zinc to meet the demands of our growing population, we shall do well. Due to the phenomenal deposits of the Sullivan mine, zinc is a lap ahead in the race, and a substantial part of the electrolytic zinc made at Trail is exported. We have been lucky with nickel, too, and the advantage conferred by the richness and size of the Sudbury deposits is likely to remain with us. Ores of aluminium and tin, which we lack at present, would be a welcome addition to our list, and the slim output of platinum would stand augmenting.

All told, it is a fortunate thing for Canada that our principal advance in mining today is gold, with its non-competitive market. In the gold fields prospectors can pursue their search and investors can put up their capital, secure in the knowledge that no discoveries in other parts of the world will either rob them of their market or reduce the price of their product.

RADIO AIDS MINING

Radio is beginning to have a place of some importance in the mining industry. At first it offered a lucrative market for galena and other crystallized minerals for use in receiving sets. Now it is serving the industry directly.

While on a trip fifty miles from the railway in northern Quebec a few weeks ago we learned the ...

sults of the recent famous (or notorious) fistic encounter, round by round, by radio. A few days later, on a Sunday, we were interested to pick up a sermon delivered in Philadelphia. It began in the orthodox fashion with a text, but then proceeded to the life history of George Washington and a review of the American Constitution, at which point we shifted to a concert. There was no mail service at this camp, but the operator kept in touch with world affairs, commencing with baseball, through the radio each evening.

Recently the broadcasting stations have included educational talks in their programmes. Short, non-technical expositions of various features of the mining industry are included. One such talk, broadcasted from the Marconi station in Montreal recently, gave a very good resumé of Quebec's asbestos industry. It was estimated that 200,000 listeners heard it. We would judge that this is a very effective means of enlarging the public's knowledge of the little-known mining industry, particularly because no inspired paragraphs and unwholesome stock advertisements can be sandwiched into the radio talk, as is done invariably in the general public's chief source of mining news, information and misinformation, the daily papers.

Some of the radio receiving apparatus now available is so compact and light and so reasonable in price that it is available even to prospectors, who are usually impecunious and must travel light if they are in earnest about their work. Thus the loneliness and solitude of even these pioneers of the mineral industry can now be alleviated by the use of a radio set.

Mining camps and mining prospects have long been notorious for their isolation. This was relieved somewhat by the telegraph, and still more by the telephone; but the cost of the wires often was prohibitive. Now comes radio to provide a link with the outside world that costs no more than a canoe or a blacksmith forge. Truly, civilized man has conquered the wilderness.

NEW MAP OF LAKE ATHABASKA

The Geological Survey, Ottawa, has issued a map (publication No. 1991) of Lake Athabaska, on a scale of 8 miles to the inch, which shows the geology of the shores on an accurate geographical base.

COLD DRIP AND END OF STEEL

A little cold drip runs down my neck,—
A little cold drip gets bigger, by heck!
Sing ho, for the out of door life!
It runs down my spine and encounters my toes,
Now all of me's wet and most of me's froze:
Sing ho, for the out of door life!

A little cold bacon lies in the pan;
The grub is enough to sicken a man:—
Sing h-ll, for the out of door life!
The fire is out and the blankets are wet;
The little cold drips are dripping yet:—
Sing h-ll, for the out of door life!

A little grey ticket is in my jeans;
I'm fed right up to the neck on beans:—
Sing ha, for the end of steel!
A dining-car menu's the goods for me,
And this is the last of the woods for me,—
Praise be, here's the end of steel!

J. C. M.

Natural Gas and Petroleum Resources of Western Canada

The Manufacture of Carbon-Black—I

By NEWTON W. EMMENS

On August 25th, 1923, Regulations were established by Order-in-Council permitting the use of natural gas for the manufacture of carbon-black in localities where there is no immediate or reasonably prospective market for the gas for domestic or industrial purposes. This is an important step in the right direction, which will result in the building up of an industry in Alberta and other places where there are large supplies of natural gas remote from present or immediately prospective centres of population, and will make profitable those ventures in the search for oil that have resulted in the discovery of natural gas only; which ventures, if permission to utilize the gas in the manufacture of carbon-black and other by-products had been withheld, must have resulted in loss.

New Carbon-Black Regulations

The Regulations are well considered and take care of the interests of the present and future population adjacent to the gas fields as well as those of the operators. The outstanding provisions are:

Natural gas can be utilized for the manufacture of carbon-black only where the producing field is too far distant from a centre of population to make the piping of the gas to that centre a reasonable proposition.

If the gas contains gasoline in commercial quantities, the gasoline must be extracted and saved before the gas is burned to carbon-black.

If, at some future time, after the factory for the manufacture of carbon-black has been established and is in operation, any community or company holding a franchise to supply natural gas to any centre of population constructs a pipe line to the wells supplying the carbon-black plant, such holder of the franchise shall be entitled to purchase the amount of gas necessary to supply the centre of population up to the capacity of the wells, and the carbon-black plant will be allowed to burn only the surplus gas for the manufacture of carbon black.

Gasoline to be Extracted

The provision requiring the extraction of gasoline from the gas before using it for other purposes is a wise one; but the question as to what constitutes gasoline in commercial quantities is one that, from the experience of the writer, cannot be decided off hand, because it depends wholly upon the price that can be obtained for the gasoline, f.o.b. tank cars or in pipe line at the works and the amount of gas treated daily. In some instances it would be a profitable undertaking to treat natural gas containing as little as one-tenth gallon (0.64 Imperial pints) of gasoline per thousand cubic feet, and in others it would not pay to treat gas containing less than three-tenths gallons (1.92 Imperial pints). The type of plant and the process used is also an important factor in determining this point. It has been proved by actual experience that a gas from which three hundred gallons of gasoline was recovered per million cubic feet of gas, treated by one process, yielded five hundred gallons per million cubic feet when using a different system of extraction.

While the regulations do not specifically state that the gasoline (when existing in commercial quantities) contained in the natural gas must be extracted and recovered before the gas is sold for domestic and industrial purposes, this also should be done, not only because the gasoline is more valuable as a liquid for automotive purposes, but because it is a source of much trouble in a pipe-line, due to its condensing, particularly in cold weather, collecting in the low places in the line, and obstructing the free flow of the gas. There is another advantage also, which will be fully appreciated by operators supplying communities with natural gas through long pipe lines, in removing the gasoline from the gas. This is that the water present in the gas both in the form of vapor and as water is also removed. Water in the gas is a source of much trouble, due to its condensing in the pipe lines, collecting in the low parts of the line and freezing in cold weather.

Heating Value of Residual Gas

Some persons are under the impression that taking the gasoline vapor from natural gas materially reduces the heating value of the residual gas. This is not so, as has been proved by the investigations carried out by the U. S. Bureau of Mines, the results of which were published in Technical Paper 253. The following figures taken from this publication are of interest in this connection, giving as they do the B.t.u. of the untreated gas, the B.t.u. of the residual gas after the removal of the gasoline, and the amount of gasoline in gallons (U.S.) recovered per thousand cubic feet of gas treated:

B.t.u. value of intake gas	B.t.u. value of residual gas	Loss in B.t.u.	Gallons of gasoline recovered per 1,000 cu. ft. of gas
952.0	939.0	13.0	0.115
1,098.2	1,048.2	28.2	0.234
1,148.8	1,087.0	61.8	0.573
1,420.6	1,170.6	250.0	1.580

The percentage loss in heating value of the gas ranges from 1.76 to 17.60 and is so small that it requires delicate laboratory apparatus for its determination. It is interesting to note that the heating value of the residual gas showing the greatest loss, namely 250 B.t.u., is still very much greater than that of the intake gas which contained a little over one-tenth gallons of gasoline per thousand cubic feet. The heating value of artificial gas such as is used in a great many cities is between 500 and 600 B.t.u., so that 1,000 cubic feet of natural gas with its contained gasoline removed equals from 1,500 to 2,000 cubic feet of the manufactured variety, for heating, cooking and power purposes—a matter of no small importance to the average consumer.

Unfortunately, however, the market for natural gas in east central Alberta for domestic and industrial purposes is very limited and there is no prospect of the population being able to utilize even a small percentage of the available supply for many decades to

come. It is therefore necessary to consider other uses to which this gas can be put profitably. One of these is in the manufacture of carbon-black.

Characteristics of Carbon-Black

Carbon-black is the name given to that pure, intensely black, flocculent form of carbon made by the burning of natural gas with a smoky flame by admitting insufficient air for complete combustion. It has properties that are unobtainable in any other black pigment that has been produced hitherto and it fills a place in the arts that cannot be taken by any other known substance. The more important of these properties are: unique brilliancy and intensity of color, complete freedom from hard and gritty particles, great covering power when made into ink by mixture with oil and chemicals, reinforcing properties when added to rubber, and its extreme minuteness of division. This last is better understood when we realize that one cubic inch of carbon-black contains 1,905,000 square inches of surface, or about one-third of an acre, according to the investigations of W. F. Weigand, the American rubber chemist.

Uses and Markets

The industrial uses of carbon black are: in the manufacture of printers ink; the rubber industry, including automobile tires both pneumatic and solid; stove polish; shoe polish; typewriter ribbons; carbon paper; phonograph records, paints for ships and structural iron; carriage cloth; cameras; coloring leather; electrical insulators; celluloid; cement colors; drawing inks; artificial stone; tile; tarpaulins; buttons; etc. There is a good export demand from France, England, Japan and China, and so soon as Germany, Austria, and Russia get back on their feet they will be in the market for large quantities. To the Canadian producer the markets of Great Britain and other members of the British Empire. and of Japan and China, offer exceptional opportunities for building up an important business that will absorb all the carbon-black produced in excess of that required for home consumption.

Yield from the Gas

The quantity of carbon-black obtained from each thousand cubic feet of gas burned depends upon two factors; first the composition of the natural gas, second the particular use for which the black is intended. The average yield is from one-half pound per thousand cubic feet of natural gas from Wyoming, up to one and eight-tenths pounds per thousand cubic feet of natural gas in Kentucky, according to the information contained in the chapter on Natural Gas in the "Mineral Resources of the United States," issued by the Department of the Interior of that country, for the year 1921.

The variation in yield of carbon-black due to the difference in composition of natural gas is well exemplified in the following extract from a letter from N. B. Burr of the Columbia Carbon Co., Williamsport, Pa., which appeared in *Chemical & Metallurgical Engineering* on July 25th, 1922. Mr. Burr says:

"Actual experience of our Company has proved that the identical factory, when moved to a new location and using leaner gas, may show a diminution in yield of as much as 30 per cent. This is, of course, due to the difference in the composition of the gas. The following analyses of gas from three different states will illustrate;

	No. 1 gas percent	No. 2 gas percent	No. 3 gas percent
Methane	80.5	94.12	46.45
Ethane	18.0	3.44	43.10
Carbon dioxide	0.0	0.40	0.96
Nitrogen	1.5	2.40	9.49

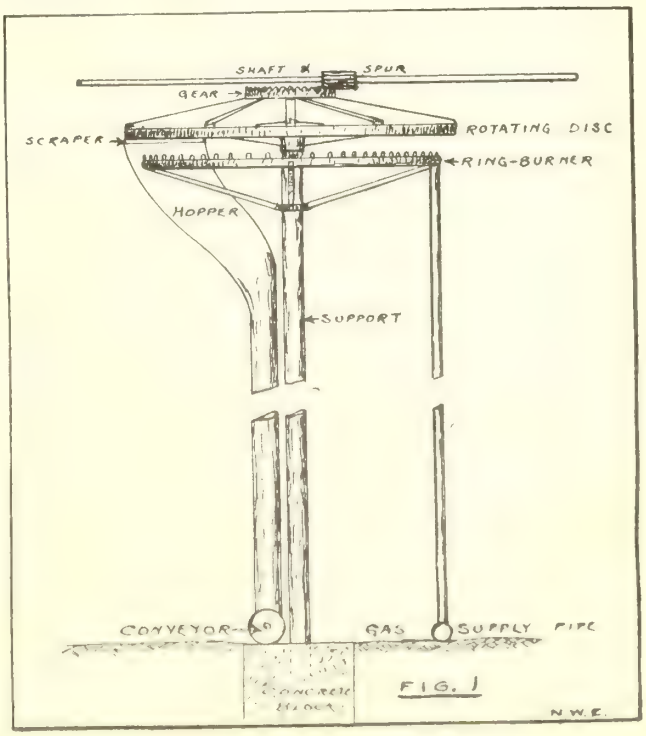
"A standard type factory, operating on No. 1 gas, averaged 1.4 pounds per thousand cubic feet. The same factory, removed to a new location, using No. 2 gas, produced only 0.9 pounds per thousand. A factory of the same type and design, similarly equipped and operated, yielded an average of 1.75 pounds from No. 3 gas."

The No. 2 gas contained 38.8 pounds of carbon per thousand feet of gas, which with a recovery of 0.9 pounds in the form of carbon-black, showed an efficiency of 2.66 percent. The No. 3 gas contained 44.3 pounds of carbon black per thousand feet and yielded 1.75 pounds, an efficiency of 3.95 percent. The No. 1 gas containing 39 pounds of carbon per thousand feet with a recovery of 1.4 pounds shows an efficiency of 3.58 percent.

An Opportunity for Research

While this efficiency is admittedly low, no process has yet been devised that will obtain a greater yield of carbon black of the required quality. Some years ago attempts were made to decompose natural gas in a retort under intense heat in the presence of a catalyst, and yields of from 8 to 10 pounds of carbon were obtained per thousand feet of gas treated; but this material was not carbon-black as that substance is known to the trade; it was a heavy gritty powder, deficient in color and lacking all the properties that make carbon-black so useful; in fact, a jobber to whom the material was submitted stated that it might do to blacken the face of a minstrel, but it was most certainly good for nothing else.

The Bureau of Mines of the United States has done much valuable work in the endeavor to find a process that will obtain a better yield of carbon-black of the required quality from natural gas, but nothing



commercial has yet been worked out. Of these experiments more will be said at the end of this article.

There are four processes in commercial operation for the manufacture of carbon-black. They are the small disc, channel, large plate, and roller processes. The chief difference in these processes is in the shape and size of the surfaces upon which the flame impinges and deposits its carbon-black, and in the speed at which the depositing surface moves over the flame. A brief description of these processes follows:

Small Disc Process

This process is the invention of A. R. Blood, who obtained a patent for it in 1883. The same process, with a few improvements in details, is used extensively at the present time.

The disc (see Fig. 1) upon which the carbon-black is deposited is made of cast iron. It is 36 to 42 inches in diameter and has a 6-inch face. This disc is set upon the top of an upright, made from a length of pipe of the required size, into which is fastened an axis upon which it is rotated, at the rate of one revolution in fifteen minutes, by means of a suitable gear and pinion. When set up it much resembles a flat umbrella.

Below the disc are arranged lava-tip burners set in a ring made of ¾ inch pipe 28 to 32 inches in diameter, according to the size of the disc used. This ring contains from 18 to 24 tips and is supported by the gas supply pipe together with braces from the upright.

The scraper for removing the carbon-black as it is deposited upon the under surface of the disc is in continuous contact therewith, and immediately below it is a hopper to collect the carbon-black as it falls from the disc and to conduct it to the conveyor on the floor between the rows of burners. Fig. 1 is a sketch of one of these rotating-disc burners set up.

These burners are set in rows of 21 each, with two, but more often four, rows in a building. Between the rows on the floor is located a spiral conveyor, made of sheet iron, 8 inches in diameter. At the discharge end each conveyor is connected, by means of suitable piping, with the main conveyor system of the plant, which collects all the carbon-black from the burner-buildings and conveys it to the bolting and packing house. (See Fig. 2.)

Each row of discs has a separate drive shaft, which is rotated by means of a pinion from a gear on the main power shaft in the alley between the buildings.

The burner-buildings are of sheet iron fastened to a frame work made of ⅜" by 1½" x 1½" angle iron. They are 15 to 20 feet wide and from 95 to 110 feet long. Along the ridge of the building openings are provided for the escape of the gases of combustion. These openings are covered with a movable slide so that the size of the opening can be changed and the draft regulated as may be required by atmospheric conditions. In the more recent plants the burner-buildings have chimneys, provided with dampers, set at intervals along the ridge. These have proved more efficient, particularly in sections where the climate is cold in the winter. Along the base of the buildings slides are provided to control the amount of air admitted to the burners, while a door at each end with two on either side furnish means of access to the interior.

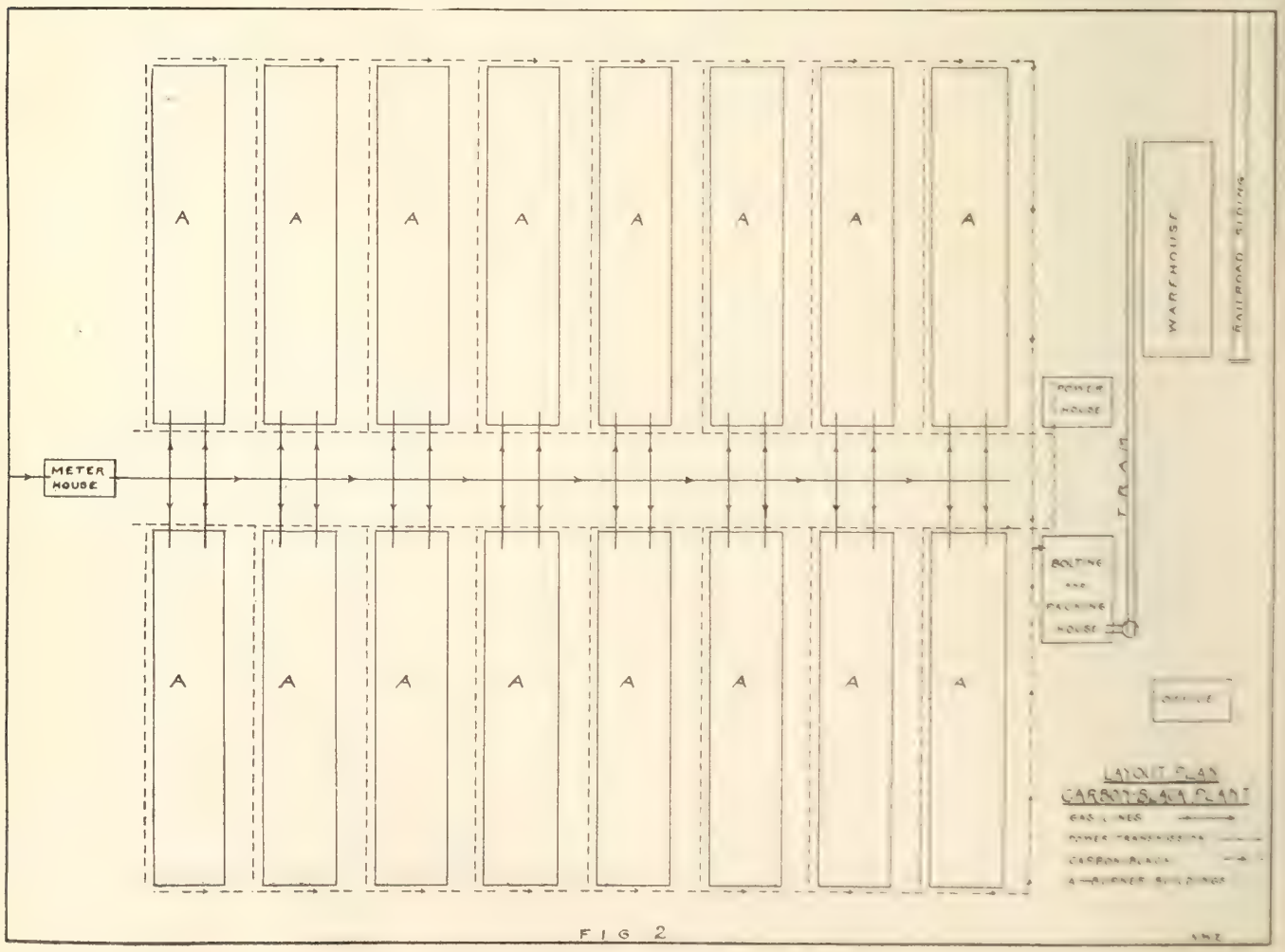


FIG 2

The buildings are arranged in rows on each side of, and at right angles to, a road. The distance between rows and individual buildings depends much upon the climate of the locality where the plant is built. In a warm section these distances are greater than in a cold, but it is usually from 5 to 10 feet between buildings and 15 to 20 feet between rows.

From the burner-buildings the carbon-black is conveyed, as previously stated, to the bolting and packing house, where it is delivered to a bucket elevator that elevates it to the first set of bolting machines, which remove any coarse, hard particles, dirt and scale. From here the carbon-black is passed through a second bolting machine having a finer screen and from these to the storage bins.

The bolters consist of a steel wire screen fastened to the end of a sheet iron cylinder enclosed in a box made of galvanized iron. A shaft to which is attached a spider with six arms, each of which carry two fibre brushes, revolves slowly within the bolter and forces the carbon-black through the screen. The material that will not pass through the screen is removed from time to time and thrown away. The first set of bolters have a screen of eight meshes to the inch and the second set one of fifty or sixty meshes.

The storage bins are made of galvanized iron and vary in size according to the ideas of the operator. Usually they have a capacity sufficient to take care of two or three days' production of the plant so as to avoid a plant shut-down in the event of trouble in the packing or shipping department; also in order to take care of the output over Sundays and holidays when the packers do not work. The storage bins have a conical bottom which is connected with the packing machine by a spout, which latter is provided with a gate to control the flow of carbon-black or to shut it off entirely.

The packing machine used for carbon-black is similar to that used at sugar refineries and consists of an auger inside a metal tube, which presses the carbon-black into a heavy paper bag. The machine is so designed that when the packer is stopped for changing bags the flow of the free-running carbon-black is arrested and there is no leakage past the auger. The machine is set so as to pack a uniform amount into each bag, which for domestic trade is 12½ pounds, or a quarter barrel. For export, fifteen pounds is put in each bag. The movement of a lever starts the machine and it stops automatically when the bag is filled with the prescribed amount. The time required to fill a bag is about fifteen minutes.

From the packing house the bags of carbon-black are taken to the warehouse, which is located on the railroad siding, or other main line of transportation. Carbon-black intended for export is packed in iron-bound boxes containing twelve to fifteen bags; that intended for domestic consumption has a second paper bag put over the first and is loaded into box cars in a similar manner to flour.

A carbon-black plant is divided into units, each of which is complete in every detail and can be operated independently of any other. The units consist of 16 to 20 burner-buildings, one bolting and packing house, one power house, a meter house and a warehouse. Only one office is required, irrespective of the number of units constituting the plant. Each unit usually has a capacity of 3,000 to 5,000 pounds of carbon-black per day and it operates every day in the year, Sundays and holidays included. A general lay-out plan of one of these units is shown in Fig. 2.

The power required to operate each unit is 20 to 30 horsepower, which is supplied by a gas engine of the two-cycle type, or where high pressure gas is available, by an ordinary steam engine, the gas being used expansively in the place of steam and being exhausted into the low-pressure gas lines feeding the plant. The practice of thus using gas for power purposes is to be commended because of the saving in cost made thereby, the only expenses being that of the lubricating oil for the piston and bearings of the engine. Where the gas used in operating the steam engine is under sufficient pressure to cause it to frost the cylinder and freeze up the exhaust on expanding, it is warmed before going to the engine by running it through a coil of pipe laid in the burner-building nearest the power house, thus eliminating all trouble from that source.

(To be continued)

CANADA'S SUPPLY OF CARBON-BLACK

Statistics just issued by the Department of the Interior of the United States show that for the year 1922 there was produced in that country 67,795,129 pounds of carbon black from 53,629,214,000 cubic feet of natural gas, an average of 1.3 pounds per thousand. The actual sales of carbon-black during the same period were over 15,000,000 pounds more than the total production, the excess being supplied from stocks that had accumulated during previous years and were held in storage. The increased demand for carbon-black from the rubber industry and the resultant absorption of stocks in storage resulted in a rise in price to 24 cents per pound.

Carbon-black is not yet being manufactured in Canada, but negotiations are now in progress to establish factories in the Alberta gas fields that are remote from centres of population. In 1922 there was exported from the United States to Canada over 1,500,000 pounds of carbon-black, some of which was valued at 40 cents per pound, this grade being used in the manufacture of special printing inks used for embossing, lithographing and half-tone work.

GERMANS MAKE COKE FROM LIGNITE

At a meeting of the Lignite Institute of Freiberg, in Saxony, held recently, a complete economic unit of a trial plant for the manufacture of coke from brown coal or lignites was demonstrated. The coke produced is quite different from that made by the usual coking processes, is very porous, and contains a large quantity of gas. It is described as a brown-coal flame coke. One German firm had an oven of this type, constructed in accordance with the Limberg patents, in operation for about a year, and raw brown coal is treated satisfactorily, even if it contains a high proportion of water-soluble ash. In this process the coal is subjected to the action of inert gases at a specific temperature, and, owing to the careful heat treatment, the yield of tar is stated to be larger than that obtained in other processes.

LARGE DEPOSITS OF COBALT ORE

There is under development in the Cloncurry district of North Queensland, Australia, an important deposit of cobalt ore. Concentrates are being turned out at the rate of 100 tons a day. It will be interesting to see whether this mine, worked for cobalt alone, can withstand the competition of ore from Cobalt, Ontario, where cobalt ore is merely a by-product of silver mining, with arsenic as an additional important by-product.

Letters From Readers

Quebec Asbestos Industry

To the Editor
Canadian Mining Journal

In your issue of Sept. 7th., you published a letter from Mr. Samuel Davis, in which he takes exception to sundry points in my articles of recent date on the Quebec Asbestos Industry, to which I herewith reply.

Mr. Davis apparently agrees with me on the importance of mill fibre production, inasmuch as he informs us of the sales of mill fibre having exceeded the sales of crude for over 20 years. He also tells us that "the same rock from which crude alone was extracted was milled to recover fibre, and it was only milled to the point where it was possible to pay for the cost of milling by the increased value of extracted fibre." This is very interesting and is exactly what the writer advocated.

Mr. Davis then informs us that "market conditions govern the percentage of recovery of fibre in any mill." Surely this is a dream. The productivity of any mill is governed by two things only: (1) the fibre content of the rock going into the mill; and (2) the efficiency of the milling process. Neither of these has any connection whatever with market conditions. Mr. Davis possibly advocates a policy of waste, in order that present market conditions may be maintained, although this seems unbelievable. For it must be allowed that to permit fibre to get away is equivalent to waste; and even the maintaining of present market conditions has already become somewhat difficult, due to supplies of fibre available from South Africa, and other sources, and ultimately will become still more difficult.

The "dust" which Mr. Davis claims "costs more to produce than it will fetch," a sample of which the writer secured twelve hours after a snow-fall last winter about fifty feet from a mill, contained 40 per cent of fibre, most of which was about 1-4 in. long, and some of it longer. I have never suggested that it is either desirable or profitable to make dust, but I do suggest, and most emphatically maintain, that the fibre that has been extracted should be prevented from going to waste, as is now the case in some mills, and therefore I have suggested certain means to attain this end.

Mr. Davis agrees that I am probably correct in assuming that from 25 per cent to 30 per cent of the possible extraction is wasted. I accept his view that 100 per cent of the mill rock yields 75 per cent of its fibre content, but I go further and credit the mills with liberating 87 1-2 per cent of the fibre. The 12 1-2 per cent additional fibre is lost,— *extracted and then lost — allowed to vanish into space with the dust.* As mentioned above, this is and has been the writer's point throughout. Stop the loss of fibre that has been already extracted; do not extract anything that cannot be sold profitably.

According to Mr. Davis, milling methods have not changed appreciably during the last twenty years. It would seem to be true, for the writer knows of one mill being built which is an exact replica in both construction and equipment of one completed in 1913. As probably there is more truth than poetry in Mr. Davis' letter, in view of his long connection with the industry, his admission of lack of improvements in milling procedure during so lengthy a period hardly reflects the progressive spirit which he would have us believe exists.

Maybe the maintaining of market conditions has barred the way to progress and so has brought about the stagnation indicated. An efficient mill will meet all market demands, whether today's or tomorrow's; but the fibre wasted will certainly not pay dividends at any time.

Mr. Davis is apparently not aware that there are a number of mills in the province where only one stage of crushing is the practise, and others with only two stages.

I thank Mr. Davis for the light his letter sheds upon the shady spots, which in some measure probably accounts for the silence the industry has maintained during its struggles to regulate prices, in preference to improving the efficiency of its milling operations.

Montreal, Que. G. Ernest Booker.

THE KEELEY MINE

By ALEXANDER GRAY

A detailed and authoritative description of the Keeley Mine cannot but add to the interest in the South Lorrain silver area. Nothing of the sort has appeared in the Canadian press. London, however, has been favored with the facts, widths and values being set forth as follows:

"The company owns two claims, which adjoin, known as the Keeley and the Beaver Lake. In 1922 the company produced 775,349 oz. of silver, and for the first half of the present year 826,814 oz. The ore bodies are lenticular, the lenses being considerably shorter than those found at Cobalt, but there appears to be a disposition at depth for increase in length and richness, for so far the best ore located has been in the 7th level, 480 ft. below the collar of the No. 3 shaft. There are two working shafts—No. 4 on the Beaver Lake, and No. 3 on the Keeley; the former finishes at the third level, and the other continues down to below the 7th level—at present the deepest working area of the mine. The principal vein —the Wood's—outcrops, about two-thirds showing on the Beaver Lake and the remainder passing into the Keeley claim. No. 4 shaft was sunk on this vein, and is therefore an incline, the vein dipping eastward about 65 deg. The first level at 75 ft. was driven by the original owners, who took out of the property silver to the value of about $6,000. The next level located in the northern section a rich chute known as 'D3,' some 60 to 70 ft. long, of high-grade ore. The first two levels from the No. 3 shaft are of no great importance. On the third level, at 235 ft. from collar, the Wood's vein has been drifted on for 1,200 ft. In the southern section there is a stope 175 ft. long and 75 ft. high in the oxidised portion of the vein. The ore is, however, difficult to treat with the present process. On the fourth level values up to the present have been low. On the 5th level there are three veins of good value. On the 6th level there are also three veins, all of which appear to show high values, which lack of space prevents detailing. On the 7th level there are four productive veins, there being, moreover, two shoots in the Wood's vein. In the Wood's vein 40 ft. assayed from 500 to 14,800 oz. of silver to the ton, one part of the shoot 12 ft. in length, with a width of from 6 to 15 in., assayed 8,000 to 14,800 oz. of silver to the ton. At the south part of the vein a shoot having a length of 198 ft. gave an average assay of 370 oz. over an average width of 19 in. Another vein, No. 26, sometimes called the 'Birthday,' was discovered in December of last year. In this vein has been determined the most consistent shoot of high-grade ore so far located. It had a length of 74 ft., and averaged 2,600 oz. across an average width of 15 in. It is reported that the company, in drifting along the shoot, mined 250,000 oz. of silver without any stoping. This vein is in the south part of the level, and is a branch of Wood's vein, and after very gradually leaving it, parallels it for about 60 ft., at a distance of 2 to 5 ft. It then turns to the north-west, just about the point where the ore shoots begin to develop. At one point it had a width of about 5 ft. Another vein, the No. 20, was discovered in the early part of the year, also in the southern part, containing high-grade ore. The remaining vein, No

16, is a branch of Wood's vein, and has been followed westward for some 226 ft."

It is explained on behalf of the Hamilton-Ehrlich interests, who own a large share of the Keeley capital, that "it is too early for any definite opinion to be expressed as to persistence at depth, but it is very encouraging that the best values are found at the lowest level. The outlook for the mine appears to possess great possibilities."

The latter sentence is commendably conservative and merits emphasis. Keeley management has the distinction of refraining from overestimates where the developments have been so satisfactory. "Well enough" is "good enough." From year to year Nipissing set an example by putting its silver in reserves at about the rate of its output. The Keeley does not require projections into the future since Dr. Bell proved himself to be a prophet in his day and generation—and in his own country—which does not often happen to Canadian mining field-marshals.

BLANKET CONCENTRATION ON THE RAND 19 YEARS AGO

The July issue of the *Journal of the Chemical Metallurgical and Mining Society of South Africa* contains a discussion on blanket concentration by J. M. Neill, of which the following is part:

The tendency now is to substitute corduroy for copper, or where it is not desired to go as far as that, then to make corduroy tables supplementary to copper tables. The case of the old Jumpers mill forms a basis for the latter method, and points of interest applicable to the present discussion [on blanket concentration] may emerge from a short history of what took place there.

In October, 1904, my attention was drawn to the large quantity of so-called free gold in the tailing. This gold did not float on the pulp, but it did float on mercury, and would not amalgamate. I concluded the gold was coated, and made the following experiment:

One of the 11 ft. x 5 ft. copper plates was covered with navy canvas, the pulp run over it for some hours, then stopped. Assays of each foot of concentrate were made and the tailing examined. It was found that over 90 per cent. of the recoverable gold was caught on the first 18 in. of canvas, and the tail exhibited apparently no free gold.

Small blanket tables were then placed at the foot of the copper plates. Those were all in position by the end of the month and were 5 ft. long by 5 ft. wide. Each blanket table was divided into three compartments by two strips of wood running lengthwise from top to bottom. The pulp was fed through holes in the top launder, leading to each compartment. The blankets could be cleaned by plugging the holes, rolling up the canvas, burlap or black blanket as the case might be, washing and returning it, and proceeding to the next compartment. The idea in this case was to avoid stopping the stamps. A barrel was put into use and much the same results got as described elsewhere.

In the meantime cyanide tests were made on the supposed free gold, varying strengths of cyanide, alkali and time of treatment were tried, but practically no gold was brought into solution.

The gold was found to be coated with clear and glasslike ferrous silicate, which could be distinctly seen through the microscope. The net result of the new arrangement was that the mill, which had been getting under 50 per cent. of the total recovered gold, sands alone being at that time cyanided, very quickly obtained a recovery of over 60 per cent. of the total when sands and slimes were being treated.

The burlap jute or black blanketing required cleaning twice each eight hours' shift. I tried a number of materials for the purpose of concentration and found that some collected more concentrate than others, with a decrease in value for the increase in bulk, but that the tail remained fairly constant. Milling was through 60 screening. There were no tube mills in use.

The next step to which I would draw attention was an increase in the total recovery, which rose to 70 to 72 per cent. recovered in the mill. This was brought about by defloating the lustrous minerals, as already described in the *Journal* of this Society. To be added to that description is the additional fact that mercury losses, which were based on mercury used in feeding and dressing, as was the system in those days, were reduced from 20 to 21 per cent. to between 6 and 8 per cent.

The rippling motion mentioned will have no effect in causing floating particles to sink, but by the eddying resistance set up it may cause floating particles to take longer to rise to the surface, and also particles with a tendency to sink may be caused to take so long to do so that they are carried completely beyond the recovery point. Therefore corduroy with less than 3-16ths of an inch corrugation might be tried across different portions of the table and either chemical or mechanical means of deflotation to obtain better extraction, especially in the area of the fourth and fifth blankets.

Regarding mercury substitute, I tried grease at the Geduld, the resulting recovery being within a few per cent. of that recovered by mercury. The mercury position having eased, this line of investigation was not pursued further, although it has distinct possibilities.

EFFICIENCIES OF CYANIDE SOLUTION

An investigation of the comparative solvent powers of potassium cyanide, sodium cyanide, and calcium cyanide has been undertaken at the Rare and Precious Metals Station of the United States Bureau of Mines, Reno, Nevada. It would appear from preliminary results that there is not much difference in the three salts, although the cyanide loss with the calcium salt seemed to be greater than with the other two. Mill tests on a number of ores that are typical of certain sections were made to determine whether these were amenable to cyanidation, and the results were reported to the operators.

HOW IT HAPPENED

A lumberjack with a broken leg was taken to a hospital for treatment. After the leg had been set, the nurse asked him how the accident occurred. He replied:

"You see Ma'am, it was this way: I was skyhooking for the Potlach Lumber Company and I had only one ground mile. He sent up a big blue butt that was a heavy one. I saw her yaw and yelled to him to give her a St. Croix, instead of which he threw a sag and gunned her, and that broke my leg."

"Yes," the nurse replied, "but I don't exactly understand."

"Neither do I," said the lumberjack. "That darn fool must have been crazy."

Mining and Prospecting in Central Africa

Copper, Radium, Tin and Cobalt, Produced in Katanga. Gold, Copper, Asbestos and Graphite Concessions in Sudan

One of the largest unexplored mineral areas of the world lies in central Africa. The phenomenal rise of the Katanga region of the Belgian Congo as a producer of copper, radium and other metals during recent years has been due in no small measure to the foresight and energy of Mr. Robert Williams, who is one of the conquering army of bankers, merchants and business executives that have marched out of Aberdeen, Scotland, to all quarters of the globe. Mr. Williams was formerly very active in organizing and directing gold mining operators on the Rand. Then he joined forces with Belgian capitalists to open up the Katanga deposits. Now he has undertaken to explore a region on the northern side of the equator in the little known upper Sudan, round the continental divide between the Congo and the Nile. In speaking recently in London to shareholders of the British companies whose capital is invested in the undertakings, Mr. Williams said, in part, as reported in a recent issue of the *South Africa Mining and Engineering Journal.*

Vast Belt of Copper Ore

In 1902 I said I believed the Katanga copper belt would ultimately produce 1,000 tons of copper per day, if everything that makes for economical working were brought to bear, particularly cheap transport to the coast and Europe. Since I have visited the copper belt this time I am more than ever confirmed in this opinion. I had long formed the opinion that the so-called mines discovered over 250 miles of Katanga had probably originally been glaring green carbonate outcrops which had attracted the natives, who had probably found enough ore without bothering to explore for extensions underground, and that in all probability what we had discovered was one continuous reef which would be found as rich underground, where it had no outcrop, as where the natives had worked it. I advised George Grey and every engineer we sent to Katanga to prospect on those lines. This view was confirmed by Mr. Farrell, the first American mining engineer I sent out to report on these deposits, and it was further confirmed by the discovery of ore at Kambove adits, and the discovery last year at Ruashi mine of 5,000,000 tons of ore containing 500,000 tons of copper, 1,500,000 tons of which is direct smelting 19.3 per cent. ore. Further drilling is proving ore all the way between Ruashi and the Star, and beyond the Star, and all where nothing outcropped. At Luushia the extension of that mine has been proved for miles on either side. But what shows the continuity of this great copper belt most of all is the western section of it, which I had never seen before. I travelled over 120 miles of it. Unlike the eastern section, where the wealth is mostly under surface level, that of the western section is chiefly above surface level. It stands up in bold hills, the geological formation of which is the same as the eastern section, with the same ore, with slight variations as to value. You can stand at Ruwe mine, as I did, and see these bare hills of copper standing out of a sea of forest country, marking the line of the great copper reef, with faults here and there, right away to Fungurume. I motored along the Fungurume mine and its extension for about 20 miles. The highest point of this range is 1,000 feet above the local river level.

Enormous Copper Reserves

I went over most of these hills of copper accompanied by Mr. Barzin, the mining engineer of the Union Minière, who knew them all, and each and every one had been proved by tunnels, surface trenches and drills. In one mile of the 20 miles at Fungurume, 9,000,000 tons of ore had been proved. At Musonoi there is a group of mines within 1,100 miles by rail of Lobito Bay, in which millions of tons of ore have already been proved to exist. At Ruwe Mine, in this group, £100,000 in gold has already been extracted. Gold, platinum, palladium, vanadium and copper exist there. The existence of large supplies of cobalt and uranium ores has also been proved in the eastern section. About ten miles out of the 250 miles of this copper belt has given a development of 68,000,000 tons of ore, containing about 4,500,000 tons of metallic copper. These ten miles represent operating mines and proved bodies of ore over the whole 250 miles. If ten miles has given 4,500,000 tons of metal, 40,000,000 tons of copper is a very conservative estimate for the whole 250 miles. I believe that the real policy for the Union Minière to pursue is to go ahead with all processes and try to perfect them all as they proceed.

Radium, Tin and Cobalt Ores

I also visited the uranium deposit at Chinkolowe, and the development work done there has already proved the existence of a sufficient quantity of rich ore to supply the radium works at Oolen for a long period. Since January, 1923, the plant has been producing radium commercially on a scale sufficient to cover amply the requirements of the whole world. This new industry is now well established, and is running under very satisfactory conditions, entirely in conformity with our expectations.

The production of cassiterite during 1922 amounted to 670 tons, and during the first five months of 1923 it amounted to 302 tons. It is intended to increase the monthly output to about 80 tons in the near future. This cassiterite is of high grade, and frequently reaches 72 to 74 per cent. tin, and the resulting metal is of very high quality. A new tin factory is now in operation at Hoboken for the treatment of the Katanga ores.

As a result of tests on the cobalt alloys made at the Lubumbashi smelters last year, an electric furnace is now under construction in Katanga for the production of high-grade cobalt alloy. This alloy will be exported to Belgium, and a treatment plant for this material will be installed at the Oolen works.

The Luena collieries in Katanga, which I also visited have reached the stage of regular production, the output for 1922 being about 60,000 tons of coal, and there is reason to hope that this will be doubled during 1923

Large-Scale Prospecting in Upper Sudan

While in Khartoum I discussed the affairs of the Nile-Congo Divide Syndicate with the authorities there, and am pleased to say I have been able to settle in principle with the Sudan Government a satisfactory basis for the further development of our interests. The general lines of the arrangement which the Sudan Government is prepared to accept are: First, that the syndicate will have five years' exclusive prospecting rights over 60,000 square miles on condition that it spends £100,000 during that period. Second, that the syndicate would have the right, subject to reasonable conditions, to work any payable discoveries it may make either in partnership with the Government or on a basis of a reasonable mining lease and royalty. The details are now being discussed, and certain conditions will have to be compiled with, but I can say that

the Sudan Government authorities are dealing witih me in a fair and broad-minded way.

Gold, Copper, Asbestos and Graphite

During the past year prospecting work has been carried on in various parts of the concession, and up to the present twenty-six prospecting areas, each of ten square miles, have been registered. Of these areas thirteen are for alluvial gold, eight are for copper and gold ore deposits, three are for reef gold, one is for asbestos, and one for graphite. The work done has been confined to prospecting, and has resulted in the discovery of further extension of the gold-bearing copper reefs in the north-western part of the concession, and according to Mr. A. P. Thomson, who is in charge of the work in that part of the concession, the copper occurrences, apart from the large Hofrat-el-Nahas mine, extend over a distance of thirty-six miles. Two areas located along a twenty miles extent of the Ibba River for alluvial gold have recently been examined by our engineer, Mr. J. G. Bower, who reports favourably upon them. In the south-eastern part of the concession prospecting work has resulted in showing a very general distribution of alluvial gold in a large number of main and tributary waterways over a large area, which show very encouraging indications in a number of localities. On the whole the results of the work done to date are very encouraging.

PERSONAL AND GENERAL

Mr. C. H. Poirier, of New York, has been visiting the Porcupine and Cobalt districts recently.

Mr. Leslie Steindler has returned to New York from Northern Ontario, where he visited the properties of the Dominion Reduction Company, Lorrain Consolidated and Croesus.

Mr. H. A. Barker, of London, who has been visiting Northern Ontario, has sailed for Buenos Aires.

Dr. Charles Camsell returned to London last week after inspecting the oil-fields of northern France and Belgium.

Mr. James J. Denny, metallurgist of Nipissing Mines, is in Bermuda on a holiday.

Mr. R. M. Wolvin visited the Scotia steel plant at Sydney Mines when on his tour of inspection recently in Cape Breton. The plant has been closed down for some time, but Mr. Wolvin said emphatically it would not be scrapped.

Mr. H. J. McCann, assistant manager of the Dominion Coal Company, has taken over the duties in Sydney relinquished by Mr. D. H. McDougall. He has been the temporary incumbent of this position on former occasions.

Mr. T. J. Brown, Deputy Minister of Mines for Nova Scotia, visited recently the property of the Eastern Harbour Coal Mining Company, where it is hoped sufficient coal will be disclosed by development in progress to warrant establishing a colliery.

Messrs. J. B. Petrie, Mechanical and Electrical Engineer, and Angus McDonald, Superintendent of Mines, Wabana, spent a few days in Cape Breton lately, where their many friends were pleased to meet them.

DIAMOND PRODUCTION

The value of diamonds produced in South Africa, during the six months ended June 30 is placed at more than £2,000,000, or double the total for the whole of last year. It is reported that certain European interests are endeavoring to establish a diamond-cutting industry at Kimberley. Definite steps have been taken to obtain concessions as well as the support of the Union Government.

RADIO INSTALLATIONS IN THE NORTH

The Canadian Corps of Signals are to erect wireless stations for the North West Territories and Yukon Branch of the Department of the Interior and a party is now in the Yukon territory engaged in installing the equipment at the Dawson and Mayo stations before the winter sets in. Early next spring another party will go to McMurray, northern Alberta and Simpson in the North West Territories and install radio apparatus there. Upon the completion of the stations, competent operators will be placed in charge and it is anticipated that this system will do much to assist in the development of these districts.

For many years the Yukon territory has had to depend on the telegraph line from Dawson to Hazelton, B.C., for communication with the outside world. This line was maintained at a cost of more than a quarter of a million dollars annually and notwithstanding the untiring attention to duty of the patrols, especially in the great wilderness between Hazelton, B.C., and Whitehorse on the Yukon river, interruptions occurred in the service, resulting in losses to those engaged in development work in the territories. One of the heaviest snowfalls on the continent occurs on the eastern slope of the Rocky Mountains in the district traversed by the telegraph line, so that in the past the line patrols have had to contend with deep snows in winter and floods and forest fires in summer. Incidentally the new service will bring means of communication to the districts in which development has made rapid strides during recent years, namely, the oil and gas fields of northern Alberta and the Mackenzie district, and the gold and silver areas of the Yukon.

Will Replace Wire Lines

When the proposed four wireless stations have been completed and are working, direct service by wire between Dawson and Hazelton will be discontinued. However, for the use and benefit of transportation companies operating boats on the Yukon river and for the residents of Whitehorse in the Yukon and of Atlin, B.C., the service will be continued between Dawson and Atlin. All telegraphic communications between the Yukon and the outer world will then be transmitted by way of Mayo, Simpson and McMurray. At the last named point connection will be made with the Government telegraph wire line to Edmonton. The new system will have a daily capacity of 5,000 words, which, although considered greater than will be required for some time, provides for future expansion. A great saving in annual upkeep of the Yukon service will be effected by the radio service. The cost of installation is estimated not to exceed $75,000 including construction of necessary buildings and cost of aperation for one year. The cost of maintenance will be much below that for the telegraphic service.

The value of radio in the far north is rapidly being recognized. For a number of years officials of the Government and others have been carrying, as part of their equipment, receiving apparatus. To surveyors, receiving sets are absolutely essential in order to secure the time from the Observatory to determine longitude, while travellers to the north in general speak with appreciation of the part being played by the wireless in the development of this great Canadian hinterland. — *Natural Resources.*

The Empire's Resources of the Base Metals

Sir Richard Redmayne Gives Summary of Copper, Lead, Zinc, Tin and Aluminium Resources, and Compares Them with the World Supply

Sir Richard Redmayne, the eminent British authority on the base metals, read a paper recently before the Royal Society of Arts, in which he discussed in a broad way the Empire's resources in these metals and their relation to the world's supply. He said, in part:

Copper

Copper, which figures so largely in the base metal industries, is the metal as to which the British Empire is worst off in point of domestic supplies.

The average annual world's output of copper at the beginning of the Nineteenth Century was only about 9,000 tons; by the middle of the century it had grown to 40,000 tons, and at the end of the century to over half-a-million tons. In 1913 it was nearly one million tons, and in the record year of 1917 it had amounted to one and one-half million tons.

In the year 1919, the British Empire contributed only 6 per cent. to the world's output of copper; in 1920 7 1-2 per cent., and in 1921 8 1-2 per cent.

The country chiefly affected by the decline in production since 1917 is, of course, the United States of America, for she produces normally over 50 per cent. of the total world's output, and large as is her proportion of the world's production, she controls a still larger production by ownership of mines in other countries, notably Chile and Peru.

The British Empire, with Canada and Australia as the chief producers, does not supply sufficient copper for her needs, nor even for the needs of the United Kingdom alone. Thus, the pre-war consumption (1913) of the three greatest copper consumers in the world was as follows:—

U. S. A.	340,000
Germany	225,000
Great Britain	138,000

or, in the case of Great Britain, one and a half times the Empire's output.

The great increase in the world's production and consumption of copper is chiefly due to the vast expansion in the use of electricity for power and lighting purposes which has characterised the last 25 years. Indeed, the importance of the metal in modern industry is shown by the fact that the motor car trade in the United States alone consumed 50,000 tons of copper in 1922.

From the point of view of potential resources, the British Empire contains extensive areas of copper-bearing ground which might, with advantage, be subjected to close investigation with a view to increasing the output of that metal.

From this Empire point of view Canada presents the most likely source of increased supply, particularly British Columbia. It is reported that millions of tons of copper ore have been proved in Northern Manitoba, where development has been active for several years.

The production from the Otavi mines in South West Africa is also increasing, and production may soon be expected on a larger scale from Papua, where there are extensive deposits of high grade ore.

The deposits of the Union Miniére du Haut Katanga in the Belgian Congo are largely controlled by British capital. Hitherto the production from these mines has been hampered by length and cost of transport, but these difficulties are gradually being overcome and the production, which in 1921 was about 30,000 tons, is increasing rapidly, being over 40,000 tons in 1922.

The chief hope for the more economic treatment, and consequently gradual lowering of the price of the metal, would appear to be in the wider application of flotation methods in concentration of the ore and new leaching processes for the extraction of the metal from the ore, permitting as they do large deposits of low grade ore to be worked.

Lead

The world's production of lead ore, expressed in terms of metal (long tons) for the year 1913 was 1,705,000 tons and for 1921 had declined temporarily.

The British Empire is in a somewhat better position in respect of lead than as regards copper. Taking the years 1919, 1920 and 1921, the Empire produced respectively, 17 1-2, 12 1-2 and 24 per cent of the world's production. The United States, Spain and Mexico are the greatest producers in the world.

But the amount produced within the Empire falls short of the amount imported into the United Kingdom. There is imported annually into the United Kingdom something over 200,000 tons of lead in one form or another, but she exports a certain proportion of this, either as pig lead or manufactures of lead, to the extent of between 70,000 and 80,000 tons.

Before the War, Germany used to obtain from her own mines about 50 per cent. of the lead smelted in that country: the balance she drew from Australia and Mexico—largely from Australia in the form of concentrates, but the increase in smelting capacity in Australia during the War must materially affect the present position in this and other respects.

From all one can learn it would appear that the lead mining industry is exceptional in being one of the few branches of the base-metal mining industries which is not over-developed. It is remarkable also, that no great discoveries of lead ore have been made within recent years, and it looks as if the developed resources were being exploited near to, if not up to, their full capacity. Although we are far from meeting our requirements in lead, the Port Pirie lead smelting works of the Broken Hill Associated Smelters Proprietary Limited, in Australia, (the largest works of the kind in the world) is capable, when working to full capacity, of producing 200,000 tons of pig lead and 8 to 12 million ounces of silver per annum.

The United States is the largest producer of lead in the world. It is also the greatest consumer of that metal. Spain and Australia both export more lead than America.

Taking the last pre-war year, we find that 82 per cent of the world's production was derived from five countries, viz., the United States of America, which accounted for 37 per cent; Australia, 20 per cent; Spain 15 per cent.; Germany, 6 per cent.; and Mexico, 5 per cent.

Lead enters into a vast number of industries. It is, however, chiefly consumed in the making of white-lead paint, pipes and sheets, coverings of cables, and as an alloy with antimony and tin. It is also used largely for storage batteries, in enamel, glass, pottery, etc.

Britain is the largest importer of lead in the world.

Before the War, Spain supplied 38 per cent of our requirements; Australia 28 per cent.; U. S. A. 15 per cent.; and Mexico 10 per cent.

The perfecting of the flotation process of concentration has had the effect of rendering possible the retreatment of considerable accumulations of zinc-and-lead-bearing tailings and residues at the Broken Hill Mines of New South Wales.

Before the War, a total loss of 5 per cent. in smelting lead concentrate was considered good practice with a fairly good equipment. Of course, in smelting low-grade concentrates or slags containing lead, which had to be resorted to during the War, particularly on the Continent, the losses were much greater. The loss in smelting Serbian slag containing 8.5 per cent. lead was as high as 24 per cent. I merely mention these facts as pointing to the scope still remaining for research work.

Our resources of lead, within the Empire, are considerable. Burma alone should contribute greatly in future to the British requirements in this respect, and, looking to potentialities at home, I am one of those who believe that our own supplies will be found to be well worth further exploitation as foreign costs increase. It was the more cheaply worked deposits of Spain which originally rendered unprofitable the lead-mining industry at home, but since the day when lead-mining was extensively prosecuted in this country, methods of extraction have greatly improved.

Industry is very active in the United States of America, and credible observers consider that during the present year that country will consume more lead than it produces.

Galena—lead ore—is the chief source of silver, and the position of the precious metal in point of demand, and consequently of price, must have an important bearing on the value of lead.

Zinc

The ores of zinc are closely associated with those of lead, and the two metals are in many cases obtained from the same mine. Just as in the case of lead, the United States of America far exceeds any other country in the quantity of zinc she produces.

Taking the years 1919, 1920, 1921, the contribution of the British Empire to the zinc production of the world was 1 per cent., 6 per cent., and 30 per cent. respectively, of the world's production, the low figure for 1920 being due primarily to the strike at the Broken Hill Mines in Australia.

In point of consumption, taking the year 1913 as a normal year, the position stood thus:

United States absorbed	308,000 tons.
Germany	228,000 tons.
United Kingdom	191,000 tons.

Those three countries are the chief consumers of the metal. The British Empire meets only one-third of the requirements of the Mother Country.

The use of zinc in commerce has grown rapidly. Formerly its use was practically restricted to the manufacture of alloys with copper, tin, and lead, but the realisation of its value as a coating material and the discovery of the galvanising process gave an enormous impetus to the consumption of zinc, and probably 65 per cent. of the total zinc smelted is consumed in this way. But there are numerous other uses to which it is put, one of the most recent being in the form of an alloy with aluminium in the manufacture of aeroplane parts and shell fuses.

The two most noticeable features in respect of zinc at the present time are:—

(1) The rising production of electrolytic zinc, notably in Tasmania, Canada and the United States of America, and

(2) The fact that, as a result of the War, the world's smelting capacity of zinc is largely in excess of the ore-production. The capacity in this respect of the United States of America alone is now 800,000 tons per annum.

As Mr. Gilbert Rigg has informed us in his interesting article, "The Zinc Industry at the close of 1919," prior to the War, there was, for all practical purposes, but one method of extracting zinc from its ores, namely, the distillation process. "The possibilities," he said, "of leaching and electrolysis had been discussed and tried out for more than a quarter of a century, but, in spite of numerous attempts ranging in scale from laboratory experiments to more ambitious efforts reaching in at least one case to very large expenditure indeed, the effect upon the industry was so small as to be negligible."

The electrolytic process is now an acknowledged commercial success, although still the greater part of the production is due to distillation.

As illustrating the headway made by the electrolytic process of recovery one may point to the potential production of electrolytic zinc from the following well-known concerns:—

Anaconda Copper Mining Co., Great Falls, Montana, 55,000 to 60,000 tons. (This company recently acquired the American Brass Company, and will require more than this quantity of zinc for its own consumption).

Electrolytic Zinc Co., Risdon, Tasmania, 40,000 to 60,000 tons.

Consolidated Mining and Smelting Co., Trail, B. C., 20,000 to 25,000 tons.

Judge Mining and Smelting Co., Park City, Utah, 2,500 tons.

Brunner Mond and Co., England, 1,700 tons.

It would certainly seem as if electrolytic extraction will gradually supersede the distillation process with resultant saving in cost.

Black, indeed, was the outlook for zinc two years ago; there was little market and nearly all the home smelting-plants were shut down. By the end of 1922 the position had materially improved. In America, for instance, the metal had nearly doubled in price, and there were barely two weeks' supplies in stock, thousands of tons having gone to Europe to meet the increased demand. In 1921, the production was less than half that of what may be described as a "normal" year (e. g., 1913). Zinc with copper constitutes the alloy we know as brass. Improvement in the engineering trades means an increase in the demand for zinc. Production in the present year is not likely to exceed consumption, stocks have greatly diminished, and the engineering trades are slowly improving. A recovery from the last two and a half years' depression would appear to be in sight.

Tin

The Empire position in respect of tin is different from that of the three previously named metals, inasmuch as the Empire is the chief contributor to the world's production, accounting for more than half of the annual output. The Malay States are the chief producer, contributing over 36 per cent. of the world's output; then follow Bolivia and the Dutch East Indies, with about 20 and 15 per cent. respectively.

At present the consumption and production of tin appear about to balance, a feature which may be contrasted with copper where during the last two or three years drastic curtailment of output was resorted to.

Tin is peculiar in that its sources are few and far between, and few new deposits have been discovered in recent years, although it appears probable that the Belgian Congo will become an important producer in the not far distant future. It would seem that, unless really extensive deposits are yet remaining to be discovered, tin will be one of the first of the base metals to be exhausted, and so far as I am aware, no satisfactory, or, at any rate,

cheaper substitute than tin as a covering medium in "tin-plates" has as yet been found, and in the manufacture of tin plates lies the chief consumption of tin. For the purposes of cooking utensils aluminium will probably take the place of tin, copper and brass.

Tin is of importance in the making of certain alloys, e. g., bronze, fusible metal, pewter, Babbitt metal and type metal.

The smelting of tin ore is concentrated in few hands, although the tin smelting capacity of the world is well in excess of the annual supplies of ore. In this respect the Straits Settlements heads the list, with a capacity of about 58,000 tons, Great Britain coming second, with a capacity of about 34,000 tons, and the United States of America third, with a capacity of 30,000 tons. These figures are in terms of metal, the total world smelting capacity being about 175,000 tons per annum.

An interesting feature of the tin situation is that costs have been brought down to a point where the industry will be in a healthy condition as soon as more normal consumption is reached.

Aluminium

Although aluminium, in the form of the silicate, is perhaps the most plentiful metalliferous mineral in the world, owing to difficulty of extraction, it is only of late years that it has come to be used commercially on a large scale. Although, too, during the war period the Central Powers, being short of supplies of bauxite, were forced by pressure of circumstances to endeavour to extract aluminium from clays, this is not yet a normal commercial possibility.

Bauxite, which contains from 30 to 60 per cent . of alumina, is the chief source of the metal, but only the comparatively pure mineral can as yet be used profitably for extraction of the metal.

The uses to which aluminium is put are very numerous, largely owing to its lightness and resistance to oxidation. It forms alloys with several other metals; is used in the construction of aeroplanes and airships, in telegraphy and telephony; in the manufacture of explosives, and many other directions. If a process could be discovered whereby aluminium could be applied to the coating of iron its use would probably be vastly extended.

In 1913 the British Empire accounted for little over 1 per cent. of the world's production of bauxite; in 1917, 2 per cent.; in 1920, 5 per cent, and in 1921, 9 per cent. The increase in the contribution from the British Empire is due to the development of the deposits in British Guiana

The United States of America is the chief producer of bauxite, contributing 43 per cent. (1921) of the world's output.

France comes next with 25 per cent. (1921).

A deposit of high-grade bauxite is not a commercial proposition unless the minerals can be mined and shipped at cheap rates to the smelting locality. For the actual production of the metal water-power is desirable and is usually employed. Thus, though bauxite is not mined in Canada, the cheap water-power available at Shawinigan Falls, Quebec, makes it profitable to extract aluminium from imported ore.

Besides the deposits of British Guiana there exist rich deposits of bauxite in India and the Gold Coast.

"CHEAP" LABOUR IN INDIA

Even "cheap" "labour" has disadvantages. The case of India is cited in the current issue of *The Mining Magazine*. In the Bengal field the miner, who remains essentially an agriculturist, attends to his crop ahead of his mining duties, and consequently during the harvest it is almost impossible to man the mines. Marriage festivities likewise interfere. The past season has been an auspicious one in many parts of the coalfields. The season commenced in March and the celebrations continued until June. In one village twenty-two marriages occupied the inhabitants for six weeks, and during that time not one miner was at work. Though wages are high, prosperity seems to induce idleness and intemperance rather than industry. Attempts to economize labour by the use of coal-cutting machinery have been frustrated by the indolence of the natives engaged in loading away the coal. The net result, it is concluded, is that for at least a generation to come the coal resources of India will not be made available on a basis that will make that country a serious industrial rival of Great Britain.

INDUSTRIAL ITEMS

The Canadian Ingersoll-Rand Company has issued a new 36-page bulletin, K-201-B, describing Leyner Drill Sharpeners. The construction and operation of both the standard size and the smaller "Jacksteel" sharpener are described. Many useful hints for making good bits are included. The bulletin can be had by those interested on request.

The Bristol Company, Waterbury, Conn., U. S. A. manufacturers of recording instruments, whose Canadian distributers for the Eastern territory are Powerlite Devices Limited, Toronto and Montreal, and Gorman Limited, Edmonton, for the Western territory, have just published a new thirty-two page Bulletin on Bristol Tachometers, Recording and Indicating, which is now ready for distribution. Such instruments are finding a wide use in modern metallurgical works.

The Sullivan Machinery Company has issued recently Bulletin 72-H, describing their drill sharpeners, their construction, and their numerous uses. Bolts, chisels, and numerous other forged products can be made conveniently by these machines in addition to rock drill bits. Class "A" sharpeners are massive and durable in design and construction and have a large capacity and a wide range of usefulness. Class "B" are of lighter design and are meant particularly for hammer drill bits and shanks.

The Link-Belt Company, Chicago, has purchased the Meese & Gottfried Co. of San Francisco, Los Angeles, Seattle and Portland, whose line of production is similar to its own. A new organization known as Link-Belt Meese and Gottfried Co., with headquarters at San Francisco, has been formed to handle the Western business of the combined companies. By this means a better service will be offered to the customers of both organizations, which have always had the best reputation for quality and service.

GYPSUM MINING RESUMED

The International Gypsum Corporation has resumed operations at the Bellemarche quarry in Inverness county, Cape Breton. The quarry is 3 1-2 miles distant by railway from the shipping pier at Eastern Harbour. There are several beds available, and the ore being worked has a face 70 feet high, composed of gypsum of very good grade. The property is equipped with a mill for calcining the raw gypsum as required. The chief market is in the United States. Formerly a large part of the company's product was shipped to St Lawrence ports.

Oil Refining

The Frasch process of refining crude sulphur-bearing Canadian and Ohio oils has increased their value seven-fold.

THE MINING DISTRICTS

By THE JOURNAL'S CORRESPONDENTS

NORTHERN ONTARIO

Larder. — The Crown Reserve has started crosscutting on the 425-foot level of its Larder Lake property, and the vein should be encountered in the near future. Drifting done to date on the 550-foot level has given satisfactory results. It is understood that good ore has also been encountered in diamond-drilling at a depth of 500 feet in the company's North Crown property in Porcupine.

On the Associated Goldfields Larder Lake property, which adjoins that of the Crown Reserve, a total of 950 foot of drifting has been done on the 500-foot level, with values that are understood to be very satisfactory. A crosscut has been run to intercept the vein on the 750-foot level and the shaft is being continued to 1,000 feet.

Kirkland. — The Harvey-Kirkland is continuing work on the 200-foot level. A new hoist has been ordered and when this is installed the shaft will be continued to 400 feet.

South Lorrain. — The South Lorrain area continues to attract a good deal of attention, but outside of the operations under the management of the Keeley and Mining Corporation, very little actual work is being done. Keeley interests have taken over the Maidens property, and are diamond-drilling it, while the Mining Corporation is sinking a shaft on the Lorrain-Trout Lake property. This shaft has reached a depth of 300 feet, and is being sunk on the extension of the Woods vein. Very encouraging values were encountered in the shaft, but no large amount of high-grade ore has yet been found. The Lorrain Consolidated will shortly be in a position to commence underground work on their property, and are reported to be making preparations, but so far little has been done.

Cobalt. — During the month of August shipments of ore and concentrate from Cobalt over the T. & N. O. Railway amounted to 898 tons. Shippers were: Coniagas — 44 tons; Mining Corporation — 645 tons; McKinley-Darragh — 39 tons; O'Brien — 126 tons; and Keeley — 43 tons. During the week ending September 22nd, O'Brien shipped 64 tons, Keeley 43 tons and Mining Corporation 39 tons.

Work on the Victory Silver property has been stopped, owing to shortage of funds.

At the Genessee property, drifting is being done on a promising vein on the 350-foot level. At the annual meeting of the Genessee, Mr. F. L. Steenman was appointed Managing Director and Vice-President.

The Menago property, which is operating the Colonial Mine of Cobalt, has recently encountered more high-grade ore. During the past few weeks values underground have been more consistent and of better grade than were formerly encountered. The company is getting ready to begin shipments of mill ore to the Mining Corporation mill.

Porcupine. — On the Newray property in Porcupine, which is under option to the Coniagas, the shaft is practically completed to the 400-foot level, and when this is finished, further work will be done at 400 feet and the shaft will be continued to 1,000 feet.

Sinking has been started at the West Dome Lake below the 600-foot level, and it is understood that the shaft will be continued to 1,000 feet. Drifting has also been started from the Dome Lake workings with the intention of carrying the workings through to the West Dome.

The new incline shaft of the Davidson has reached a depth of about 100 feet. Progress is not very rapid, in view of all the reports issued regarding the intention of the company to equip and develop it with the least loss of time.

Diamond-drilling has been started on the Porcupine-Grande property, which lies near the Three Nations.

A report has been issued by the directors of the Vipond, which deals in a very encouraging way with the recent developments on the property and with its prospects for the future. The most important development during the year has been the discovery of the No. 10 vein, which has been opened from the surface to the 600-foot level. Development of this vein is giving much higher grade ore than the general average of the mine. Ore reserves as of July 15th were estimated at 210,885 tons, of an average grade of $6.62 a ton, or a total of $1,396,000. Since that date 100,000 tons of $10.00 ore has been developed, and it is understood that since the report was issued ore of a much higher grade has been encountered. The mill is being rebuilt and its capacity increased from 70 tons a day to 150 tons a day, and it is expected that it will be ready for operation by the first of December. The financial position of the company is very satisfactory. At the time the report was issued the company had $200,000 cash on hand and at the present time has between $160,000 and $170,000.

Hollinger Wins Appeal.—The Appellate division of the Ontario court has handed down its decision in the case of the Hollinger Mines against the Northern Canada Power Company, in which the Hollinger asked for $1,800,000 damages for loss suffered from power interruptions during the power shortage of 1921. The decision is in favor of the Hollinger, and reverses the decision of the Trial judge. Sir William Meredith, who was one of the judges of the Appellate Court, has died since the case was heard, so that the judgment was handed down by three judges, of whom two decided in favor of the Hollinger, and one against allowing the appeal. As the Trial judge gave a decision in favor of the Power Company, this makes two judges for and two against. The case will be carried further, and it is understood that instead of going to the Supreme Court in Ottawa, application will be made to carry the matter direct to the Privy Council, and this application for appeal to the Privy Council will probably be heard in November. If the Privy Council should decide in favor of the Hollinger, it is understood that further damages suffered during the power shortages of 1922-23 will be asked for, and as this shortage was much more severe than the one in 1921, the amount would be proportionately larger. If the decision of

the Appellate Court is upheld, this does not necessarily mean that the Hollinger will obtain all the damages asked for, as this question would go before a referee, who would decide the amount. This decision by no means ends the complicated power situation in Northern Ontario, because the Power Company has sued the Hollinger asking that the Hollinger should be compelled to sign a contract for its full power requirements, and a decision in this case is expected shortly. This latter decision is of more vital importance to the Power Company than the one regarding damages for power interruptions, as the Power company has committed itself to the development of 20,000 h.p. on the Quinze River, and this involves the expenditure of several million dollars. If it were finally determined that the Hollinger did not have to take all its power from the Northern Canada Power Company and were allowed to use the power it is developing on the Abitibi River, the Northern Canada would have a surplus of power from its plants on the Metagami River alone, without taking into consideration the amount to be developed on the Quinze. It is, of course, to be expected that this latter action will also be carried through to the Privy Council, so that it will still be a long time before the question is settled. In the meantime, the Hollinger is proceeding with its work on the Abitibi River, but is not making very substantial progress. The situation is further complicated by the fact that the Hollinger has based its plans on a 60-foot head, and this would wipe out the Sault Rapids, to which the Abitibi Pulp and Paper Company has certain rights. The Abitibi Company may be expected to oppose strenuously any infringement of these rights. The Hollinger plans have not yet been approved by the Government.

NORTHWESTERN ONTARIO

Silver Reported East of Nipigon.—A prospective new silver field is being actively prospected in Northwestern Ontario. Within the past few weeks between 700 and 800 acres have been staked and recorded with Mining Recorder J. W. Morgan, Port Arthur, and applications are continuing to come in. The prospecting, staking and recording is being done by men from Cobalt, Timmins, Schumacher, and other points in the Cobalt and Porcupine areas, among them Messrs. Currie and Barrie Johnson.

The new field is located about fifteen miles east of Humboldt Bay on the east shore of Lake Nipigon and the claims so far recorded lie along the southerly branch of the South Branch of the Onaman River. This locality is easily accessible from the Canadian National Railways, Transcontinental line, or by water up the east shore of Lake Nipigon, from Orient Bay, on the main line of the Canadian National Railways.

Very little is known as to the values being encountered, or the width, length or character of the veins; but from the enthusiasm displayed by experienced prospectors, it is believed that something substantial is being showed up, which may prove on development to be another profitable source of silver.

Activity at Foley Mine.—The British Canadian Mining Company, of which Senator George W. Fowler, Ottawa, is President, are displaying considerable activity at the old Foley Mine, near Mine Centre. The buildings have been repaired and several new ones erected. Pipe lines are being laid preparatory to unwatering the South shaft, that was put down 420 feet in former operations. The Foley is located in a promising geological section, of somewhat limited extent, with numerous veins carrying encouraging surface values that warrant intelligent prospecting and development. At present there are a number of prospectors at work in this area, carrying on preliminary development work, some of which gives some promise of success.

YUKON

Gold Declines; Silver Increases.—In placer gold mining, the Yukon Territory, it would seem from the reports of recent arrivals from Dawson, is losing ground. While this is so and although there is no present indication of its regaining the position established by the Klondyke discoveries of over 25 years ago, the Mayo silver finds assure the Yukon of a bright future as a silver producer.

Such is the opinion of those who have spent the summer investigating mining conditions in the Territory. It is said that there have not been more than 800 men engaged this year on the creeks adjacent to Dawson. At Mayo alone there were at least 500 at work in or about the silver mines. Nothing could tell more clearly the story of the decline of one and the progress of the other form of mining in this territory.

Concentrator for Keno Hill.—The hope of the Yukon lies in its newly discovered high-grade silver ores. The attention of mining men is centered in the development of these deposits. The Treadwell Mining Co. and the Guggenheims are proceeding with confidence with their plans for large scale operations. Authoritative report has it that a concentrator is to be installed on Keno Hill and that greater shipments of the product of the camp may be expected next year. The proposal is to ship without treatment only the selected high-grade material, and to add to that the concentrate from the lower grades.

Difficulties of Navigation.—Only those familiar with the Yukon can appreciate the difficulties presented by the problem of transportation. The Stewart River, down which the ore from Mayo is carried, is navigable only at high water, and high water prevails for but two, or at the most three, weeks in the Spring and Autumn. In the Spring it is necessary to transport the ore, which has been brought to the river bank over the snow during the winter, as far as the main waterway, whence it is taken to Ninano, thence by rail to Seward, and thence by ship to the Selby Smelter, California, where it is refined.

Between 8,000 and 9,000 tons of ore are reported to have been shipped this year. It can be imagined what a rush there was to get it down to Stewart River during high water. Arrivals from Dawson tell of seeing the ore piled along the river bank at the mouth of the Stewart River where it was left in order that barges might return for more, and also state that the same rich, silver-bearing ore was scattered along the streets of Dawson while waiting trans-shipment.

Dam Being Built.—This is a haphazard and unsatisfactory method of transportation. Something safer and more expeditious is necessary if the possibilities of Mayo are to be fully realized. Herbert Wheeler, general manager of the White Pass & Yukon Railway Co., which company owns and operates the bulk of the river transportation, appreciates the imperative need of improvement. In an endeavor to bring this about he has started the construction of a dam below Marsh Lake

near White Horse. At the point selected the river is approximately 300 feet wide. The idea is to hold back the waters of Marsh, Bennet and Tagish Lakes, as well as those of tributary waterways, in order that a tremendously increased pressure of water and ice may be released at a selected time early in the year. The design is to clear Lake Laberge of ice, by directing at it and its tributaries the connected forces of the upper waters, two or three weeks earlier in the year. In a word, Mr. Wheeler aims to open Yukon inland navigation about May 15th instead anywhere from the 1st to the 15th. of June each year. In the natural course of events, as experience has shown, navigation is impractical until some time early in June. If Mr. Wheeler's plan works out it will lengthen the Yukon transportation season some two or three weeks. It will make transportation from Mayo, down the Stewart River, much more economical because it will mean that the larger rivers and lakes will be open at about the same time as high water comes on the Stewart River, thus permitting an uninterrupted flow of ore from the mining camp and, of course, the equally free transport of supplies in to the camp.

The experiment is being watched closely throughout the Yukon. Many are sceptical, but Mr. Wheeler and his associates are confident of its success. All, however, are agreed that the benefits promised are worth striving for and that it will be a boon to the Mayo camp if May 15th can be depended upon each year as the date of the opening of Yukon navigation.

ALBERTA

New regulations have been passed by the Government of the Province of Alberta which aim at preventing the substitution of an inferior for a high-grade coal. The text of these regulations follows:

1. Every operator of a coal mine in Alberta shall have a registered name for his coal and all coal shipped by such operator shall be shipped under such registered name.

2. Every operator of a coal mine in Alberta shall state on every invoice and shipping bill governing shipments of coal from such mine and on a card which shall be prominently displayed on the car door:

(a) The name of the mine from which such coal is produced and the registered name of the coal;

(b) The district in which such coal is situated;

(c) The name and size of the grade coal;

(d) The date of shipping such coal and its destination.

3. Every dealer, whether wholesale or retail, selling coal produced in Alberta shall state on every bill weight ticket or invoice covering sales of such coal:

(a) The name of the mine from which such coal is produced and the registered name of the coal;

(b) The district in which such coal is located;

(c) The name and the size of the grade of coal;

4. Every dealer, whether wholesale or retail, selling coal produced in Alberta, shall keep a record in his office of the amount of coal purchased and sold from each mine under the registered trade name of the coal, such record shall also include the name and the size of the grade purchased and sold and to whom it is sold.

5. All coal advertised and sold shall be advertised under its registered trade name.

6. The province may appoint an inspector or inspectors to examine at any time within the province or at any other point all coal produced for sale.

7. An inspector at point of shipment shall have power to inspect any coal for the purpose of ascertaining whether the coal conforms with the information contained in the shipping bill or bill of lading and if in his judgment it contains an excess amount of slack or other impurities such information shall be stamped on the face of all documents.

8. An inspector shall have the power to inspect any coal whether in the possession of a dealer, either wholesale or retail or consumer for the purpose of ascertaining whether the coal conforms with the information contained in the shipping bill, bill of lading or weight ticket and whether the coal contains an excessive amount of slack or other impurities.

9. Any operator, broker or dealer, who falsely designates the trade name of the coal, the point of origin, the grade or class of coal or otherwise infringes these regulations shall upon summary conviction be guilty of an offence punishable by fine or imprisonment for a period not exceeding six months or to both fine and imprisonment.

BRITISH COLUMBIA

Mineral Rights on Vancouver Island—To eliminate the present unsatisfactory dual control of minerals lying within the boundaries of the 2,000,000 acres on the east coast of Vancouver Island and known as the E. & N. Ry. Land Belt, has been the ambition of Hon. Wm. Sloan, provincial Minister of Mines, for years.

The present situation is that the gold and silver within this area is vested in the Crown while the base metals and the surface belong to the E. & N. Ry. Co., which is a subsidiary of the Canadian Pacific Ry. Co. The prospector, when staking a mineral deposit within the Belt, must conform to the terms of the Mineral Act as far as the precious metals are concerned and, in order to exploit the base metals, must come to terms with the Railway Co. This means that he is required to pay to the Company as a rule some form of royalty on the copper, zinc or other metals produced, outside of the precious metals. It is considered by Mr. Sloan, as well as by most mining men that this condition is holding up development on the Island and is one that must be removed with as little delay as possible.

Some two or three years ago the British Columbia Department of Mines took up the matter with the Company's officials, making a proposition which may be summarized as follows:

"That, as regards the mineral rights of the E. & N. Ry. Belt remaining unalienated, the Government is prepared to go practically into partnership with the Railway Company.

"The District to become fully under the operation of the Mineral Act as far as underground mineral rights are concerned; that such mineral rights be administered by the Government; that the cost of such administration be entirely borne by the Government and that the gross receipts of all revenue received by the Government from and on account of such mineral rights including taxes, etc., be divided equally between the Government and the E. & N. Ry. Co."

Following this suggestion the Company stated that, before proceeding with the dicussions, it was desired that time be allowed them to make a thorough mine-

ral survey of the Land Belt. The Department of Mines acquiesced and it was announced that the work of this exploration had been placed in the hands of engineers associated with the Consolidated Mining & Smelting Co., another subsidiary of the C. P. R.

Now it is stated that the work of the Consolidated Mining & Smelting Co., in the section of Vancouver Island in question is practically concluded. Consequently the recent visit to Victoria of E. W. Beatty, President of the C. P. R., afforded the Hon. Mr. Sloan, an opportunity to press for a resumption of negotiations with a view to settling of the matter. Mr. Sloan had an interview with Mr. Beatty on the subject and was pleased with the result. He is inclined to believe it may be possible to arrive at an adjustment that will be mutually agreeable.

Premier Dividend. — A. B. Trites, of Fernie, is authority for the statement that the Premier Gold Mining Co. decided to distribute another dividend of $400,000 on or about September 30th. This will bring the total dividends, since the first was authorized in 1921, up to $4,450,000. Since the first dividend was paid in the year mentioned, which was at the rate of 8 per cent. on a share capital of $5,000,000, the Premier Gold Mining Co. has not passed a quarterly dividend.

Progress at Indian Mines. — G. B. D. Turner, managing director of the Indian Mines Ltd., states that a contract has been entered into with Boyle Bros., of Spokane, for 2,000 feet of diamond-drilling on the property of the Indian Mines Ltd., which is situated in the Portland Canal Mining Division northwest of the Premier Gold Mining Co's holdings. The Provincial Government has been constructing a waggon road to the property this summer. The road will open up not only the Indian Mine, but a number of other promising prospects in the same section. Mr. Turner explains that the drilling, which starts immediately, as the plant already is on the ground, is to prove up ore-bodies upon which there has been considerable surface and underground development. He asserts that sufficient information has been obtained to justify an enlarged scope of operations, large bodies of milling ore having been uncovered and only last month a new ore-body having been opened up in No. 1 tunnel. After the drilling it is proposed to build the first unit of a concentrator with an initial capacity of 150 tons daily. The installation of an aerial tramway also is under consideration. Mr. Turner makes the following general statement:

"Briefly it may be stated that the Indian Mine main veins are very persistent and extend in a general northerly and southerly direction along an intensely fractured zone. This zone cuts across the general strike of the country rock at a narrow angle. Bedded deposits are occasionally found. An average sampling across 26 feet assayed $25 per ton and other samples point to this as the average value."

Alice Arm. — The Esperanza Group of mineral claims, Alice Arm, not far from the Dolly Varden Mine, is reported to be growing more encouraging with development. This summer a small vein of high-grade ore has widened considerably as work has proceeded. At the point now reached it is three feet wide and high assay returns have been obtained. Four hundred sacks of ore are ready for shipment and two tons a day are being added.

The Homestake Mining Co., whose work has been facilitated this summer by the use of the Dolly Varden Railway for transportation, is installing a compressor on its property at Kitsault Glacier. The plant is capable of operating two drills. It will be driven by gasoline and the work will go forward all winter.

The Rex Group of mineral claims, which runs to the Dolly Varden Ry., has a promising surface showing, a four-foot vein having been uncovered that is traceable for 1,500 feet. Assay returns are not yet reported.

Government Engineer Inspects Upper Peace River. — Coal, iron, and placer gold deposits of the Peace River country, northeastern British Columbia, were examined by J. D. Galloway, government mining engineer, in the course of a tour of that territory from which he has just returned. With regard to the coal deposits, he says that they are situated at Rocky Mountain Canyon, that they extend over an area of 40 by 60 miles, and that there are a great many seams, most of them small but quite a number having commercial importance. The coal is semi-anthracite, similar to that of the Groundhog district of northwestern British Columbia, and runs very low in ash. Mr. Galloway believes that, as far as quality is concerned, it could compete successfully with the anthracite coals of Pennsylvania in the markets of the Province of Ontario. One shipment of 40 tons was made by scow to Peace River Crossing, where it was turned over to the C. P. R. to test. It is reported that the results were very satisfactory.

As to placer mining, Mr. Galloway found two companies operating with dredges. They had not, however, met with much success and a different kind of plant will be necessary to secure a higher recovery. Individuals working by hand are doing fairly well, as the Peace River sands carry much fine gold and a considerable value in platinum. Mr. Galloway says, however, that it is low-grade ground and that the dredging operations will predominate eventually.

Trail Ore Receipts. — Ore receipts at the Trail Smelter, Consolidated Mining & Smelting Co. for the week Sept. 8 to 14th inclusive totalled 3,500 tons made up of shipments as follows:

	Tons
Company Mines	2,929
Cork Province, Zwicky	39
Knob Hill, Republic Wn.	52
Lone Pine, Republic Wn.	218
Paradise, Invermere	41
Quilp, Republic Wn.	120
Silversmith, Sandon	33
Whitewater, Retallack	68
Total	3,500

Kaslo Mines Consolidated. — At a recent meeting at Kaslo of the shareholders of the Whitewater Deep Mine it was decided to consolidate with the Whitewater Mine. Major J. L. Retallack, one of the chief owners in both properties, states that it is the intention to proceed with development. W. H. Burgess, of Kaslo, was appointed managing director. R. H. Stewart, it is said, has made a favorable report as to the possibilities of the consolidation and future operations will be under his direction as consulting engineer. The Whitewater Mine is one of Kaslo's banner producers.

having paid over $600,000 in dividends and disbursed another $1,250,000 for wages and supplies.

High-Grade Ore at Windpass. — Developments at the Windpass Mine, near Chu Chua, in the Kamloops district, continue to be satisfactory as is indicated by the fact that A. B. Trites is reported to have bonded the adjoining Red Top Group of claims. The Windpass, it is reported, has uncovered a 12 foot seam of high-grade ore at the 100-foot level Additional machinery is being installed on the property and its operations will be continued on an extended scale during the winter.

Prosecutions for Law Infringement. — Breaches of the Coal Mines Regulation Act of British Columbia continue to engage the attention of the Police Courts and of the officials of the B. C. Department of Mines. For the most part these infractions of the law are of a minor character but are considered of importance because of their danger, if persisted in, to the lives of those at work underground. One such incident occurred recently when John Nigro, a coal miner, fired shots in the Granby Mine, Cassidy, in contravention of the terms of General Rule 12 of the Act. He was found guilty by the Magistrate and fined $10 and costs. Hon. Wm. Sloan, Minister of Mines, was of the opinion that there should be a more thorough investigation and ordered W. H. Wall, of Nanaimo, to conduct a special inquiry. This has been done and whether further steps will be taken against Nigro will depend on Mr. Wall's report.

Winning First Aid Team. — The coal mining centre of Cumberland, Vancouver Island, is proud of the success of its representatives in the First Aid and Mine Rescue Competitions held recently at Ladysmith. In a reception the Mayor, officials of the Canadian Collieries (D) Ltd., and the citizens generally united in congratulating the winning teams. One of the special features of the occasion was the presentation to A. J. Taylor of a fountain pen by Mrs. Walter Hudson, captain of Cumberland's first aid ladies team, on behalf of the members of that team. It was said that they owed their success and their high state of efficiency to the coaching of Mr. Taylor. In a number of addresses the importance of a thorough knowledge of the principles of first aid and mine rescue work in a coal mining community was stressed.

Self Rescuer. — Another interesting test of the Self Rescuer Apparatus, recently put on the market by the Mine Safety Appliances Co., took place at Cumberland recently. It was conducted by the B. C. Department of Mines and is said to have demonstrated satisfactorily the usefulness of the apparatus in an atmosphere heavily charged with carbon monoxide, providing there remains enough oxygen for the maintenance of life.

It was about electricity — in its earliest days.

"But after all," protested Gladstone, "What use is it?"

"Sir," said Faraday, "there is every probability that you will soon be able to tax it."

"Ah! Ah!" said Gladstone.

So to the practical man, who in these days of urgent economy must scrutinize closely every proposed expenditure of Government, the real economy of a wise expenditure on Scientific Research in connection with Canadian agriculture and industry of all kinds, is indicated by the stories of what research has accomplished.

NOVA SCOTIA

A Farewell Dinner. — At the invitation of Mr. D. H. McDougall, retiring vice-president of the British Empire Steel Corporation, the district superintendents and the mine managers of the collieries, the heads of the different departments, and a few other friends enjoyed a supper and a social hour together in what is known as "Tom Brown's bungalow." The beautiful grove, the rustic bower, the silver light on the lake, the lodge of ample size, beautiful in structure and device, the gathering of friends and the hearty greeting and glad handshake of Mr. McDougall acted like magic on the Celtic spirit, and when the stirring strains of the bagpipes struck up, passions swayed and the men of Glace Bay, New Waterford and Sydney Mines danced out in perfect rhythm the many steps of the good old Highland hornpipes so dear to Hie'lan hearts. Under the tall rock pines restraint was flung to the winds, good fellowship prevailed and in this happy mood all entered the enchanted hall and sat down to a good man's feast.

It was easy for Mr. McNeil, general superintendent of mines, who never fails to catch the spirit of any such gathering, to carry the program through to a very successful finish, and in that care-free spirit which gives the liberty of speech so necessary to full enjoyment, a very pleasant night was spent. In a few well chosen words, he told of the object of the gathering, of the desire of Mr. McDougall to bid farewell to the friends who had worked with him and who had rendered him most faithful service. He stated that all were free on that night to express their sentiments towards Mr. McDougall, and they intended to do so.

Mr. McDougall's Remarks. — After prolonged applause of Mr. McNeil's remarks, Mr. McDougall in a few measured and well thought-out remarks told of the pleasure this meeting brought to him. He had been associated with a large number of the men here for many years. Indeed some of them he had known all his life, and had always enjoyed their friendship and confidence. He had seen these men tested and tried, and well knew what they were capable of doing under any circumstances. He had watched them accomplish the impossible, — not the impossible to them, but to those who said it could not be done. There was nowhere in this wide world a finer body of men, and tonight he placed them second to none anywhere. The British Empire Steel Corporation had been attacked continually by sinister and subtle forces, vile and vituperative propaganda had been circulated broadcast against them, all the destructive forces of the country had been marshalled to assail them, but in the midst of it all and through it all the officials of the coal company had stood true to their duty and had acquitted themselves like men. It was a hard and trying experience, but in this refining furnace the dross had all been consumed and only the gold left. The excellent condition of the collieries is altogether due to their efforts, he said:

"The coal and steel industry of Nova Scotia," said Mr. McDougall, "is a big business and means much to this Province and to the Dominion of Canada. Upon its success depends much of the prosperity of the country as you all recognize. It is bigger than any one man, or all of us together, and I ask you, my friends here, to give your best service, your energy and ability to the corporation operating these industries. As in the past

you have been devoted to duty and loyal to the cause of the corporation and have labored unceasingly to advance its interests, so I ask you to continue to carry on as you have been doing, to transfer your allegiance to my successor, whoever he may be, and loyally to stand by him, and you will remain my friends more than ever. He will need your hearty support, all your united efforts for with the 23,000 men employed in the different parts of the district, there is a tremendous task ahead. You have within you the great asset to help him; that is skill, knowledge and dependability of character. It will be his to command, and yours to give, and I know you will give heartily. I am leaving the corporation with the good will of all in it; I bear no ill-will to any person, and in this happy state of mind I retire from the service.

"Your gathering here today is one of my happiest moments, for I realize more than ever before how I have been surrounded by real men, whom it was good to meet, to know and to labor with. I only wish it were possible to meet all the employees personally, at this time when such a meeting would not be misunderstood.

"I will still be in touch with your affairs, as I am not severing my connection with the corporation. I may have the pleasure of meeting more of you oftener than before; but I am glad to know when leaving that I retain your good will and friendship, which is an enduring possession."

Reply on Behalf of Staff. — After the singing of "For He's a Jolly Good Fellow" and a song by Mr. Maxwell, Mr. A. S. McNeil replied on behalf of the general staff. Mr. McNeil was reminiscent in mood and recalled past services and relationship. He dwelt on the personal characteristics of Mr. McDougall, his natural kindness of heart and friendly disposition. It was impossible to know him intimately and not to like him. As an official he served better because he felt that his services were appreciated. Men do serve better when they know this. They are inspired with courage, and the higher qualities such as devotion to duty, and loyalty to person are developed. Service tends to the steady growth of friendship. Someone has said that the most perfect friendship is found between superiors and inferiors. It is seldom found among equals, where the green eyed ogre of Jealousy and the deadly hatred of rivalry finds congenial food. Friendship is a plant of slow and cautious growth, and has its roots deep in the soil of the human heart. The storms of life cannot uproot it, and each succeeding gale only causes it to strike farther down to the very foundations of life. Such is the nature of our friendship, said Mr. McNeil. He stated that he had shared much of Mr. McDougall's confidence and anxieties caused by labor disputes and other troubles relating to mining. He had been true to him, and had given of his best and if at times this service seemed to fall short of what was expected it was because he could do no more.

Mr. McDougall had pledged all here tonight to allegiance to his successor in office; he had pointed out the path of duty, and he wished to assure him that every person present would follow his advice. "Although parting with him, we remain to perform our several tasks as faithfully as while he was with us. We regret, however, that he is leaving and feel that his going is a distinct loss in many ways."

The Presentation. — Mr. H. J. McCann, acting Vice-President, in his usual breezy, off-handed manner, stepped forward and read a well worded address, which voiced the sentiments of all present, and then presented Mr. McDougall with a diamond pin and set of cuff links. Mr. McDougall thanked his friends for this, another token of their good feeling towards him.

Speeches were made by the chief inspector of mines, A. McEachern; G. D. McDougall, Chief Engineer, and many others, which were reminiscent and full of friendship. Some of these referred to the early struggle of Mr. McDougall in rising from the ranks unaided, and the long weary road he had to travel almost alone. Of him it could be said:

"The heights that others won and kept,
Were not attained by sudden flight;
But they, while their companions slept,
Were toiling upwards through the night."

Another Wabana Slope Closed. — Another ore mine has been closed at Wabana. Ore trade just now is fairly brisk and recently several ore cargoes have been shipped to foreign ports, including some to the United States. The ore shovels at the stock piles are kept busy to meet the demand.

No Need for Royal Commission Now. — There is considerable interest and much criticism of the appointment of the Royal Commission to investigate conditions at the Sydney steel works. This arises not so much from the appointment of the commission, as from the late date at which the matter was taken up. It is generally felt that had this effort to find out the truth about the labor agitation at the Sydney steel plant been undertaken last winter in the incipient stages of the dispute, it would have accomplished something. It is difficult to see what good it can now do, seeing that the employees and employers on the plant are working in unity.

There is slightly more excuse for inquiry into the colliery affairs, which it is proposed by some should be undertaken. The Commission would find in this case distinct evidence of the injustice of the former labor leaders both to their employers and to those workmen who receive low rates of pay. It might be well to have these facts laid before the public by the Commission.

HIGH-GRADE ORE AT DEEP LEVEL

It has been announced by officials of the Treadwell Yukon Company that 400-ounce silver ore has been found on the new 300-foot level of their mine at Keno Hill, near Mayo. This is of importance, as establishing the continuity of high values to that depth.

HAFNIUM

In discussing the newly discovered element hafnium recently in England, one of the discoverers, Dr. G. Hevesy, pointed out that, though its place in the periodic table is between zirconium and thorium, its chemical characteristics show that it has a close relationship to the former.

BOUNTY ON AUSTRALIAN SULPHUR

Because the domestic production of sulphur is regarded as a national necessity, the Australian Parliament has voted £100,000 a year to provide a bounty of £2. 5s. per ton on all sulphur produced in the Commonwealth from local pyrites. The free importation of Louisiana sulphur recently caused Australian pyrites mining to cease.

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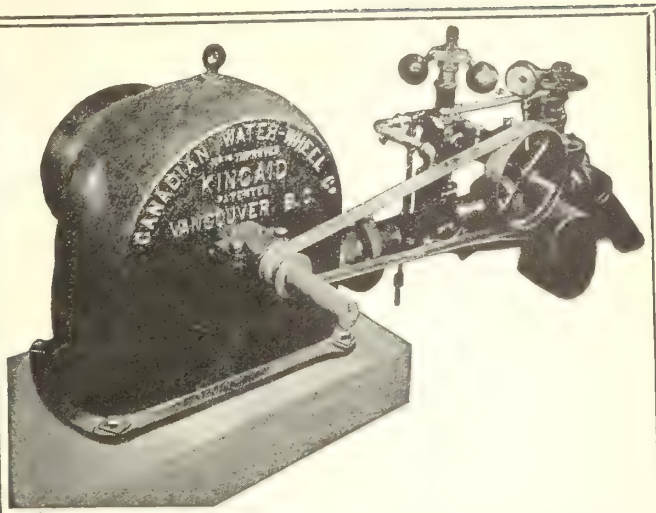

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MINES BRANCH

Recent Publications

Talc and Soapstone in Canada, by H. S. Spence.

Titanium, by A. H. A. Robinson.

Summary Report of Investigations made by the Mines Branch during the calendar year ending Dec. 31, 1921.

Phosphate in Canada, by H. S. Spence.

The Preparation, Transportation and Combustion of Powdered Coal, by John Blizard.

Road Materials along the St. Lawrence River, from Quebec Boundary to Cardinal, Ont., by R. H. Picher.

Barium and Strontium in Canada, by H. S. Spence.

The Coal-fields and Coal Industry of Eastern Canada, by F. W. Gray.

Analyses of Canadian Fuels. Part I to V, by E. Stansfield, M. Sc., and J. H. H. Nicolls, M. Sc.

Graphite, by H. S. Spence.

Gas Producer Trials with Alberta Coals, by J. Blizard and E. S. Malloch.

The Mines Branch maintains the following laboratories in which investigations are made with a view to assisting in the developing of the general mining industry of Canada:—

Fuel Testing Laboratory.—Testing value of Canadian fuels for steam raising and production of power gas; analyses, and other chemical and physical examinations of solid, liquid and gaseous fuels are also made.

Ore-Dressing Laboratory.—Testing of Canadian ores and minerals, to ascertain most economical methods of treatment.

Chemical Laboratory — Analyzing and assaying of all mineral substances and their manufactured products. Copies of schedules of fees, which are slightly in excess of those charged by private practitioners, may be had on application.

Ceramic Laboratory.—Equipment is such that complete physical tests on clays and shales of the Dominion can be made, to determine their value from an economic standpoint.

Structural Materials Laboratory.—Experimental work on sands, cements and limes is also undertaken.

Applications for reports and particulars relative to having investigations made in the several laboratories should be addressed to The Director, Mines Branch, Department of Mines, Ottawa.

GEOLOGICAL SURVEY

Recent Publications

Memoir 108. The Mackenzie River Basin, by Charles Camsell and Wyatt Malcolm.

Memoir 127. Beauceville map-area, Quebec, by B. R. MacKay.

Memoir 128. Winnipegosis and Upper Whitemouth River areas, Manitoba, Pleistocene and Recent deposits, by W. A. Johnston.

Memoir 129. Geology of the Moncton map area, by W. J Wright.

Memoir 130. Geology and mineral deposits of the Bridge River map-area, British Columbia, by W. S. McCann.

Memoir 131. Kenogami, Round and Larder Lake areas.

Memoir 132. Geology and ore deposits of Salmon River district, British Columbia, by S. J. Schofield and G. Hanson.

Memoir 133. The southern part of the Sydney coal field Nova Scotia, by A. O. Hayes and W. A. Bell

Map 68A. Moncton, New Brunswick. Geology.

Map 155A. Portions of the districts of Algoma, Sudbury and Timiskaming, Ontario. Geology.

Map 1585. Mackenzie River basin, 1922 edition. Geology.

Map 1751. Wainwright, Alberta. Topography.

Map 1752. Monitor, Alberta and Saskatchewan. Topography.

Map 1767. Sydney, Nova Scotia. Geology.

Map 1830. Vermilion; townships 47 to 55, ranges 5 to 10, west of the fourth meridian. Topography.

Map 1831. Vegreville; townships 47 to 55, ranges 11 to 16 west of the 4th meridian, Alberta. Topography.

Map 1860. Keno Hill area, Mayo district, Yukon. Geology.

Map 1948. Wanapitei Lake area, Ont. Geology.

Map 1964. Brockville-Mallorytown area, Leeds county, Ontario. Geology.

Map 1965. Fraser River delta, British Columbia. Geology.

Map 1972. Michipicoten area, Ontario. Geology.

Map 1977. Mackenzie river between Norman and Beaver river, district of Mackenzie. Geology.

Applicants for publications not listed above should mention the precise area concerning which information is desired.

Summary Report — The annual Summary Report of the Geological Survey is now printed in parts. Applicants should, therefore, state what particular geologist's report is required, or what subject they are interested in

The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon.

Communications should be addressed to The Director, Geological Survey, Ottawa.

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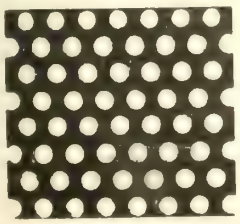

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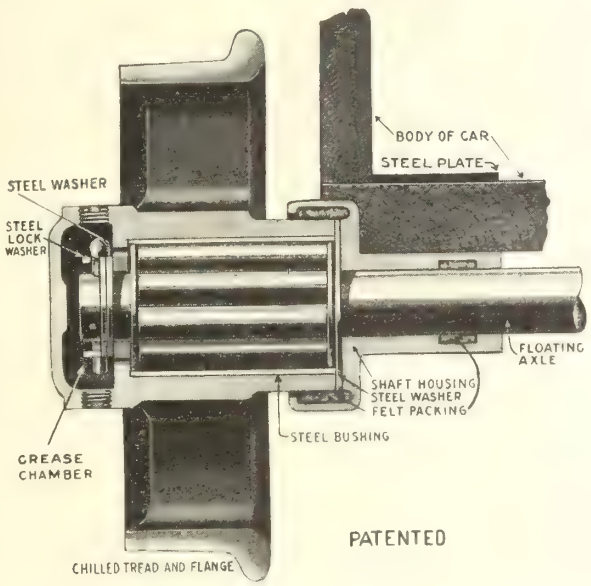

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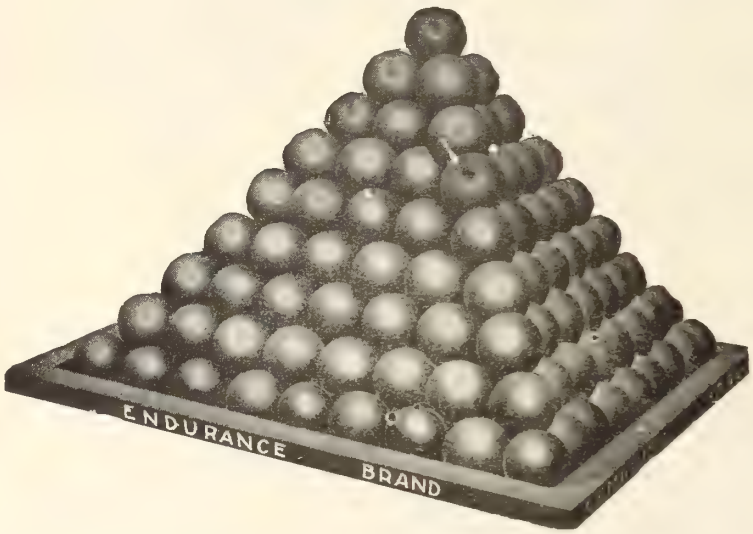

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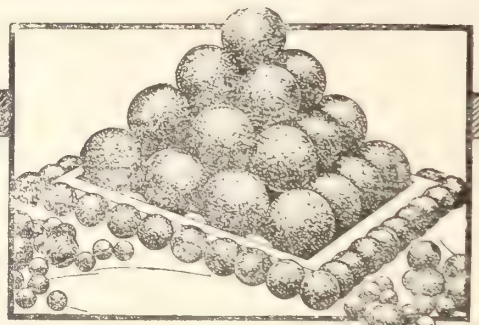

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Ontario's Minerals

PROVINCE OF ONTARIO

Hon. CHARLES. McCREA, Minister. DEPARTMENT OF MINES *Thos. W. Gibson*

Mineral Areas

Ontario, with its 407,262 square miles, contains many millions of acres in which the geological formations are favourable for the occurrence of minerals 70 per cent of the area being underlain by rocks of pre-Cambrian age. The phenomenally rich silver veins of Cobalt, Gowganda and South Lorrain occur in these rocks; so also do the far-famed nickel-copper deposits of Sudbury, the gold of Porcupine and Kirkland Lake, and the iron ore of Magpie and Moose Mountain mines.

Economic Minerals

In addition to the above, practically all economic minerals (coal and tin excepted) are found in Ontario: — actinolite, apatite, arsenic, asbestos, cobalt, corundum, feldspar, fluorspar, graphite, gypsum, iron pyrites, lead, mica, molybdenite, natural gas, palladium, petroleum, platinum, quartz, salt, talc and zinc. This Province has the largest deposits on the continent of talc, feldspar, mica and graphite.

Building materials, such as ornamental marble, limestone, sandstone, granite, trap, sand and gravel, lime, Portland cement, brick and tile, meet every demand.

Mineral Production

Preliminary returns show the output of the mines and metallurgical works of the Province for the year 1922 to be worth $62,202,169, of which the metallic production was $38,190,711.

The following figures show the growth of Ontario's mineral industry by five-year periods since 1891 when a Bureau of Mines was first established.

Year.	Value.	Year.	Value.
1891	$4,705,672	1911	$41,976,797
1896	5,235,003	1916	65,303,822
1901	11,831,086	1918 (Maximum war output)	80,308,972
1906	22,388,383	1921	48,128,387
	Dividends.		

Dividends and bonuses paid to the end of 1922 amounted to $28,096,699 for gold mining companies, and $86,238,185 for silver mining companies or a total of $114,334,884.

Mining Regulations

A miner's license costs $5.00 per annum, and entitles the holder to stake out in any or every mining division three claims of 40 acres each. After performing 200 days' assessment work on a claim, patent may be obtained from the Crown on payment of $2.50 or $3.00 per acre, depending on location in unsurveyed or surveyed territory.

Assay Office

The Provincial Assays Office at No. 5 Queen's Park, Toronto, is maintained by the Department of Mines for the free identification of minerals, free assays under the provisions of the Mining Act of Ontario, and also for general assay work as per the Schedule of Charges which may be obtained on application.

Temiskaming Testing Laboratories

The Department maintains, at Cobalt, an ore sampling and testing laboratory which is now prepared to receive parcels of gold ore from 100 pounds upward, and after sampling and assaying the same to pay to the shipper the value thereof, less treatment charges. The purpose is to afford a market for ores extracted by prospectors and others in developing their mining claims, enabling them to obtain funds which they can use for further work and to report on the most satisfactory method of treatment. Fuller information may be obtained on application to the Manager, Temiskaming Testing Laboratories, Cobalt, Ontario.

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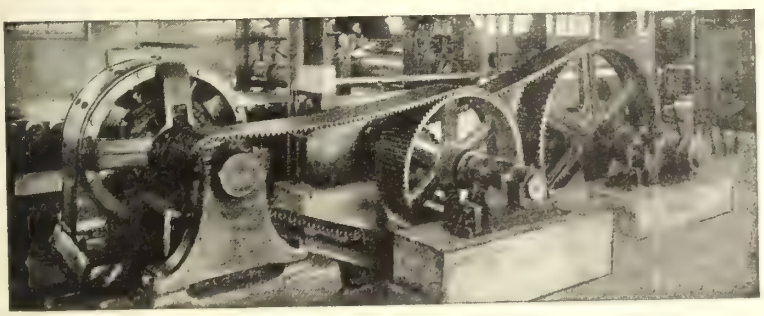

A few of the Morse chains in use at the Raymond Lead plant

Using chain drives speeds up production, cuts belt expense and overtime wages and operates with practically no repairs.

Write for Booklet

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Jones & Glassco, Regd.

MONTREAL, TORONTO.

O.W. Ludwig, *Plant Superintendent of the Raymond Lead Co., Chicago, says:*

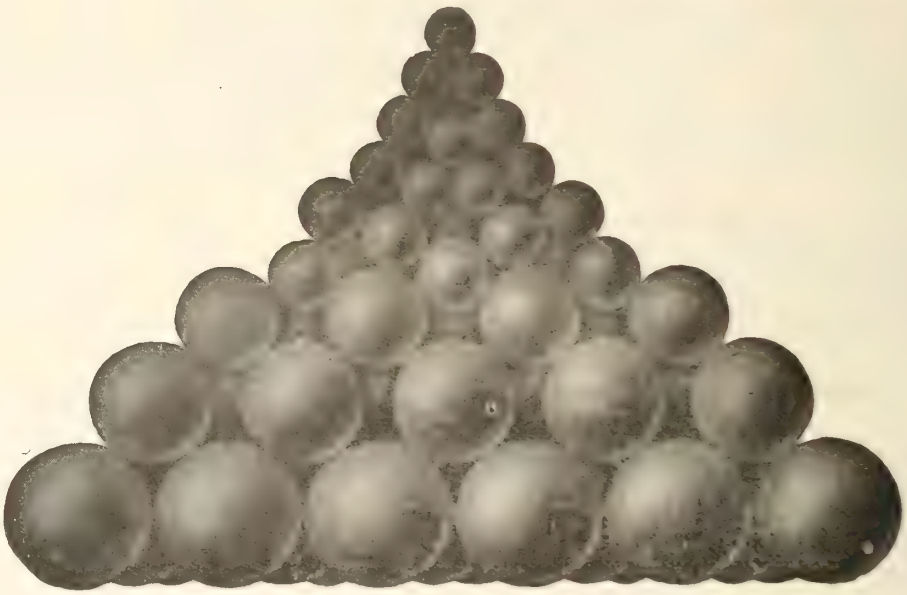
"Thirteen years of service without a repair is our experience with two 100 H.P. and ten 20 H.P. Morse Silent Chain Drives.

"When we moved into our present plant thirteen years ago, we installed the present Morse equipment of silent chains for our two lead mills and ten hydraulic pumps. We had always previously used leather belts, but not without considerable trouble. For instance, if the operator was not careful—and gave the motors too great a load, the leather belt would slip and in some cases burn out. While with the Morse Chain Drive we overload them at times up to 15 H.P. without the slightest trouble.

"When we used leather belts on the hydraulic pumps, if a pump packing suddenly gave way, the water would squirt all over the pump as well as adjoining pumps, causing the leather belts to get wet. This often necessitated a shut-down on 3 to 4 pumps to dry out each belt, thus causing a loss of time by the men which resulted many times in paying overtime to catch up on the work. Of course, with our Morse Chain Drive we have no such trouble—this positive drive prevents slippage and is not affected by water.

"Leather belts lasted us 2 to 3 years at the most, while our Morse Chain Drives have already lasted 3 to 4 times that long and seem good for many more years. So Morse Drives have cut our expense materially, speeded up production, cut out overtime wages and saved floor space, for they operate on shorter centers."

Decrease your grinding costs.



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PUBLISHED WEEKLY

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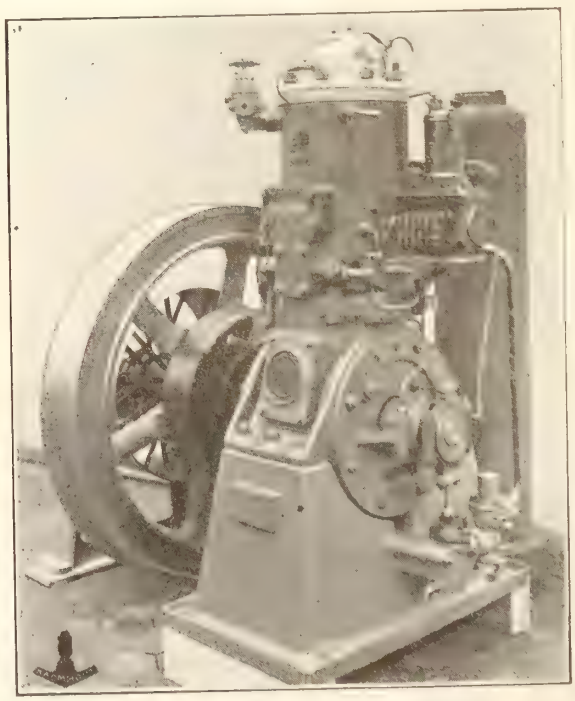

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:-: EDITORIAL :-:

TELLURIDES IN THE GOLD BELT

In the gold belt of northern Ontario and Quebec, tellurium is, rightly or wrongly, considered almost as highly as gold itself. Its characteristic occurrence is in combination with gold, so that the word "tellurides" in common parlance means tellurides of gold. It may be of interest, therefore, to trace the history of some of the known occurrences of tellurides in that area.

Tellurides were first discovered in the north country by Dr. Robert Harvie in the course of his field work for the Quebec Bureau of Mines in 1910. He found the mineral in a vein of quartz and ankerite three to five inches wide in a pit on the shore of Lake Fortune, as a small nucleus associated with a liberal amount of visible gold. The principal gold-tellurium mineral was determined as petzite. With it was associated also tourmaline and pyrite.

It is worthy of note in this connection, by the way, that the Quebec Bureau of Mines during the years 1910, 1911 and 1912 conducted the only vigorous campaigns of field work during its history. The reorganization of 1909 was followed by the three seasons of field work in the Harricanaw, Chibougamou and other regions of the north, and in Gaspé. Unfortunately the vigour of this régime ended suddenly at that point. Now, after twelve years of inactivity, there are definite reasons to hope that a renewal of this activity will take place in the near future.

At the time of the mineralogical find at Lake Fortune, it was reported that argentite had been found in the Powell claim in the newly discovered Porcupine camp. On Dr. Harvie's advice, Mr. A. G. Burrows, who had reported on that area for the Ontario Bureau of Mines, examined the reputed argentite and found that it was really telluride of gold. This stimulated a search for tellurides in all the gold veins of the countryside, and in a number of instances the silver-grey minerals that had been called galena, grey copper ore, argentite and what-not were found to contain tellurium and gold. Notable among these occurrences are the Miller-Independence at Boston Creek and the "main break" at Kirkland Lake. The popularity of tellurides among the prospectors at that time is shown by the use of their names for claims, of which the Sylvanite mine at Kirkland remains well known.

Now there come rumours of further occurrences of tellurides in Quebec. There is a mineral found in the recently discovered ore zone on the Noranda property that looks like galena, but has certain abnormal characteristics. It might be well to describe first the ore in a general way. It comprises a zone of rhyolite tuff whose finer fragments and interstitial dust have been replaced by quartz, carbonates and sulphides, the last principally pyrite, with a small amount of chalcopyrite. There is also tourmaline. Later than the pyrite, the galena-like mineral has been deposited, and with it the gold. Some of the crystals of pyrite are coated with thin films of precipitated gold. The "galena" has been examined in a preliminary way by Dr. Harvie and others, and has been found to contain less than the normal amount of sulphur. Also, its cleavage and other physical features are not those of galena. It remains to be determined by chemical analysis whether or not it is a telluride.

It would seem that wherever a soft, grey mineral is found in vein-matter or suspected gold ore near the Temiskaming sediments, it should be examined to find whether or not it is a telluride. One such instance is on the Stabell property, west of Lake Demontigny, whose ore is described in the Quebec Bureau of Mines report for 1919 as containing galena. Few of our field geologists or mining engineers are sufficiently well versed in the niceties of mineralogy and of micro-chemistry to determine exactly what these specks of grey mineral are. So long as we suspect that the presence of tellurides in a gold deposit, like tourmaline, increases its chances of containing workable ore, it will be worth while to submit to expert examination all such occurrences of soft, grey metallic minerals from the gold belt.

HOLLINGER'S POWER DEVELOPMENT

Last week we printed inadvertently in our correspondence pages a paragraph describing the work under way on the Island Portage power development on the Abitibi River that did less than justice to the Hollinger management; in fact it might be construed as unduly critical. We wish, therefore, to describe briefly today the present status of the work.

As was announced some weeks ago, the contract for the construction of the dam, power house and subsidiary structures has been let to Sir William Arrol & Co. On October 1st they took over the buildings at the dam site from the Hollinger officials and put their workmen on the actual construction, which is being pushed as fast as can be, almost regardless of expense. The engineers of this company are confident that they will have their part of the work ready for August 1st next. The Dominion Engineering Company, who are

building the turbines, and the Canadian General Electric Co., who have the contract for the generators, likewise have undertaken to provide their share of the equipment soon enough to allow of operation by that date. The plan of the switchboard, which is an extremely complicated piece of designing, has not yet been completed by the consulting engineers, Messrs. Kerry and Chase. As soon as this is done it also will be put under construction. There has been some slight difficulty in letting a contract for the power line to Hollinger Mines, but there is little likelihood that its construction will lag behind that of the power plant.

Before operations at the dam can be got into full swing or any large amount of material delivered at the site, it will be necessary to complete a three-mile spur line connecting it with the T. & N. O. Railway. No effort is being spared, therefore, to finish this spur line, and its construction has been well advanced during the few weeks since operations were commenced.

If this 20,000 horsepower power plant should be in operation by the first of August next, as has been undertaken by the various contractors, it will constitute very nearly a record for such a formidable piece of construction. Hollinger Mines have much at stake in it, as a much increased daily production of gold awaits only the provision of additional power. It is a wise economy that has directed the management in speeding up the construction of their power plant at the cost of the additional expense that always accompanies abnormally quick building.

AIDING ALBERTA'S MINERAL INDUSTRY

The annual report of the Scientific and Industrial Research Council of Alberta for the year 1922, recently published, draws attention once more to the fact that, although the mineral resources of the province remain vested in the Dominion Government, a vigorous and rapidly expanding organization has been established in Edmonton to aid and direct the development of these resources. It may be noted in passing that the foundation for this important organization was well and truly laid by Hon. Charles Stewart, Minister of Mines at Ottawa, when he was premier of Alberta.

This Council is composed of the Provincial Secretary, as chairman, the Chief Inspector of Mines, and the President and a number of the teachers of the University of Alberta. The Council employs a technical staff, engaged almost entirely on research in the field and in the laboratories. Gradually an adequate laboratory equipment is being assembled for work on coal, road materials, forest products and other natural resources. There is close coöperation between the Council and members of the university staff, many of the latter being employed by the Council for part of their time.

As Alberta is one of the world's chief repositories of coal, the Council's work is principally concerned with fuels, ranging from lignite to the excellent semi anthracite found towards its western border. Continuously there are under way tests to determine the quality of this coal from the numerous active fields and likewise investigations into the best ways of using it. Boiler trials, tests of smithy coals, trials in domestic furnaces of standard and of new design, and an attempt to solve the problem of carbonizing and briquetting low-grade fuel, are among the duties with which Mr. Edgar Stansfield and his staff on fuel research are charged. Satisfactory progress in each of these lines is reported for the year 1922.

Geological investigation is, of course, also concerned chiefly with coal. During the past year Professor J. A. Allan and N. C. Pitcher surveyed the Saunder Creek and Nordegg coal basins, underlying an area of 650 square miles. In addition reputed discoveries of iron ore on Lake Athabaska were investigated, a noticed some months ago in these pages, the prospective oil area of southern Alberta was examined and a soils survey was commenced.

The provision of good road materials is one of Alberta's pressing problems. There is very little rock or gravel available in the province for building roads. At present even the main highways consist of heaped up soil, which makes an excellent road in dry weather, but is reduced to mud when it rains. Mr. K. A. Clark is charged with the responsibility for finding suitable road materials. At present he is investigating the bituminous sands that are so abundant on the Athabaska river. A practical trial has shown that although this material will make an excellent sheet asphalt road or sidewalk, the cost of transporting it in the raw state from McMurray to Edmonton, a distance of almost 300 miles, is prohibitive. It is evident, therefore, that the bitumen must be separated from the sand before shipment. A process for this purpose has been worked out on a laboratory scale and at present is being tested on a small commercial scale, which will determine both its mechanical and its commercial feasibility. Should the experiment be successful a vast amount of road-building material will become available to the province.

There remains, however, the problem of how to use this bitumen in building roads. The usual aggregate, crushed stone or gravel and sand, is not to be had in most localities. The prairie soil is the only abundant material. Mr. Clark has, therefore, tackled the problem of making a good road from mud and bitumen. He has demonstrated the fact that mixtures of these two in certain proportions are water-proof, the bitumen coating the particles of soil and thus stabilizing the whole mass. Now he has under way large-scale tests of a road with a rigid foundation course containing a small percentage of bitumen and a surface completely impervious to water with a larger amount

f bitumen. The successful use elsewhere of bituminiz-d earth mixtures augurs well for the success of the resent important experiment.

This annual report, like its predecessors, demon-trates the fact that the Council and technical staff harged with directing and aiding the use of Alber-a's mineral resources is well organized and is in the ands of vigorous and competent executives and tech-ologists. We hope that soon the Federal Govern-nent will find it possible to give to the province the ull control of her natural resources, and thus enable he Scientific and Industrial Research Council of Al-erta to round out its prerogatives and completely to ulfil its mission.

PREPARATIONS FOR A GOLD BOOM

Extraordinary success has attended intensive pros-ecting on the Noranda and Lake Fortune gold prop-rties in northwestern Quebec during recent months. Similarly honest pick-and-shovel work has disclosed re-deposits in half a dozen other localities so en-ouraging that they compel vigorous and thorough nvestigation. In fact, according to the observation of competent observer whose business it has been dur-ng the past season to examine critically the western art of the Quebec gold area, almost every party of rospectors who have really prospected their ground luring the summer have located gold ore. On the out-ide one hears little of these strikes, except vague umors. Real prospectors do not talk much.

There are now omens of a campaign of publicity, nd duplicity, based on the genuine worth of the Que-ec gold belt, but not necessarily sharing in it. Some nterprising mining stock brokers, who make their iving by distributing to the public mining script that eldom or never has returned an income as dividends, ave bought claims contiguous to valuable properties, bviously with the intention of instituting a stock-elling campaign during the coming winter, when a 'boom'' in gold stock seems inevitable. Almost every lay now one sees the preparations for this boom in rogress. It is not a spontaneous phenomenon; it is rranged principally by men who wish to make use of he excitement to separate fools and their money.

The first move of the mining stock-jobber is either o acquire a strategically located mining claim, or else o incorporate a company at a modest one, two, three, our or five millions for the stated purpose of getting old of such a claim. In most cases it matters not whether this claim covers barren rock or is under a swamp; its location relative to well-known and valu-ble properties must be such as to look well on the nap printed in the prospectus and the newspaper ad-vertisement. If it has real chances of success on de-velopment, so much the better; but that point is im-naterial to most of these gentry.

Meantime the curiosity of the public has been aroused by mysterious paragraphs in the newspapers. One really must admire the stock-jobber for his knowledge of human psychology. He knows exactly how to prepare his public for the grand display advertisements that are to follow. Many are the artful devices that help on the campaign. In fact, the campaign is usually conducted by clever, hard-working men, whose abilities, if applied honestly on behalf of the mining industry instead of in this legalized roguery, would be a very substantial aid.

This is the method of the out-and-out swindler. There are others who mix the mining of the ground and the mining of the public, in proportions that deceive many astute non-mining men. These are more dangerous both to the mineral industry and to the public, for their occasional success in mining the ground, and the consequent return to share-holders (which is still less frequent), provides the wonderful examples of ''get-rich-quick'' whereby the salesmen of bogus stock lure their victims along the 1,000-per-cent-per-annum road to ruin.

There will be dozens of wild-cat gold mining flotations during the coming winter. There may possibly be one or two honest mining stock issues to the public: if so the *Canadian Mining Journal* will try to distinguish them and mention them in these pages. We cannot attempt to keep track of the illicit issues. They multiply like rats, or like the insect pests that likewise batten upon the human species.

It is a pity that present conditions are such that the mining industry must have its counterpart in dishonest mining stock flotations. None other of the basic industries is burdened as is mining with this incubus. Until it is removed (if ever it can be removed completely) the best we can do is to issue a warning periodically, with information as specific as can be set down publicly.

KING-KIRKLAND STILL UNDER OPTION

In our issue of October 5th, in correspondence from the mining districts, we stated that the Tonopah Company had dropped their option on the King-Kirkland property at Kirkland Lake. We have found since then that this is an error; that the Tonopah Company are still pushing vigorously their development of the property, and there is no evident intention on their part at present to stop this work.

The telephone was invented by a great Canadian scientist, Dr. Bell, and Canada has nearly one million telephones, representing a capitalization of $100,000,000. The telephone companies spend annually for research, the results of which are all about us, a sum greater than the total income of many universities, and the enormous amount saved by the use of the telephone is incalculable.

Hollinger Ore Reserves

Estimated at Over $60,000,000, After $72,500,000 Gross Income has been Earned

By ALEXANDER GRAY

The gold ore reserves of Hollinger Consolidated mines will have an estimated gross value of between $60,000,000 and $63,000,000 at the end of this year. The factor of safety always availed of in the annual reports of the company may cause the management to shade to $60,000,000 the grand aggregate of the ore reserves at that date. Already, it may be said, the reserves have climbed to that peak. The formal record, therefore, is merely a matter for adjustment. Directors have assurances to this effect. Their mines are much greater in their immediate certainties than all previous data as to tonnage and values indicated. If the higher estimate of $63,000,000 is registered by General Manager Brigham, then the net gain to be credited on account of 1923 operations will be nearly $30,000,000.

On December 31st, 1922, the gross value of developed ore, probable ore and outcrops was placed at $43,269,827. Putting the 1923 gross income at around $9,500,000—most of it from the mines—the addition of $20,000,000 net to the value of the ore reserves, and the strong treasury, will leave the company alone of its kind on this continent.

Beginning 1924 with an earnings record of approximately $72,500,000, ore reserves of $60,000,000, or more, as the case may be, and with the further intention to push development on a large scale from the 1,700-ft. level, the outlook does not require horoscopic comment. Having upset precedents and surpassed the most optimistic expectations and now promising more than it would be prudent to forecast offhand, the administration and management have to provide power, milling and metallurgical capacity to the economical limit of their mines.

A year hence it is hoped the new power plant will be in operation, and Hollinger's flood-tide of gold will begin to flow. Thirteen years will have elapsed since the first trickle of gold. By then production should be nearing the $85,000,000 mark, despite enshackling power failures, a destructive fire, labor troubles, hardships, incidental to the Great War, and the cost plus involved in surtaxes, and import duties on machinery and supplies. What has happened in the twelve years since milling began bespeaks for constructive mining more consideration than is accorded to it by leaders in finance and business.

Why the Mines Cannot be Crippled

Gold mines that, under the varying circumstances prevailing since the destructive fire of 1911, present their owners with $135,000,000 are sermons in millions, to be taken to heart by those who never devote a spare moment to reflection on what they mean. Gross profits of about $37,500,000; distributions of almost $23,000,000, leaving the treasury fortified to the extent of what may be $7,000,000, but cannot be estimated by the outsider owing to the purchase of the Schumacher property and extraordinary expenditures on power facilities and other plants, make the history of the Hollinger that of a veritable golden era.

In dividends and in what is available in quick assets for dividends, apart from the ore reserves broken in the stopes or still *in situ*, shareholders who held on have in hand or within easy reach 1,000 per cent. on their investment, even though they paid at par for the original capital issue of $3,000,000; besides which there is a market profit of $41 per share, since four shares were given for one of the original. Furthermore, as the issued capital is $24,600,000, and the gross value of the ore reserves is between $60,000,000 and $63,000,000, by including the liquid assets in the treasury it is evident there is around $70,000,000 covering the outstanding capital.

No other precious metal mine in the western world has such a balance sheet, notwithstanding the relative loss due to mishaps of the past years. For every dollar represented in the issued capital here is $2.85 now available. As a speculative investment, therefore, Hollinger securities have continuous rewards for those who retained them when more sapient financiers accepted other paper as collateral, that was infinitely more risky.

Recent developments on what at present may be regarded as intermediate levels—no deeper than 950 feet—make it inexpedient longer to ignore certain of the ore reserves. The practice has been to underestimate those reserves. During the current year, when the mill was compelled to slow down, more power was diverted toward development, hence the anticipated net gain. What part the Schumacher is playing will be stated in the annual report.

1923 Mining and Milling Results

In comparison with the two preceding years, 1923 operating results have been grievously disappointing to the directorate and the management. In 1921 gross income was $10,314,515.31. In 1922 it was $12,824,608.25 On September 9th, with four more four-weekly periods remaining until the end of 1923, the company had milled 887,257 tons, a daily average of 3,535 as against 4,029 in the same periods in 1922. Possibly the total tonnage milled in this year may be over 1,200,000, perhaps nearer 1,300,000. In 1922 the mill treated 1,491,381 tons that averaged $8.53 per ton. The 1923 milling average to September 9th was $7.78.

The gross gold and silver content of the 1923 tonnage dealt with to that date is given as $6,907,647. Of that $6,647,186 was recovered. Adding $107,165 as the premium upon bullion, and $211,405 interest on investments, the gross income for the nine periods was $6,965,753. More power now being available, and likely to be sufficient throughout the closing quarter, the 1923 gross income should not be far from $9,500,000. Whatever it may fall short of that total, will not be the fault of the management. Power shortage could not be surmounted. Failing that, the management alternatively adopted the policy of aggressive development, incidentally placing a greater tonnage of broken ore in the stopes. One section sixty feet wide, and the developments elsewhere, provided "better and better" consolations.

More than 450 men are employed on the company's Abitibi river power development. A year hence Hollinger will be self-contained and the stream of golden metal will be poured out continuously in larger quantities.

A recent British visitor to India, Mr. Wilfred Wyld, remarked on returning that "there is vast unexplored mineral wealth in the country, and anyone who is able to stand the climate and has the inclination can find plenty to do."

Natural Gas and Petroleum Resources of Western Canada

The Manufacture of Carbon-Black — II.

By NEWTON W. EMMENS

(continued from page 799)

Channel Process

This process is the invention of P. J. McNutt, for which he obtained a patent in 1892. It is regarded as one of the most efficient systems and is in common use today.

The difference between this system and the small rotating disc lies in the burner and in the surface upon which the carbon-black is condensed. The latter consists of mild steel channels seven to eight inches wide, weighing 12¼ pounds to the foot, and nine feet long. Eight of these channels are arranged side by side and bolted near each end to transverse channel beams which are supported upon wheels at either end, thus forming a table. This table is supported by a trestle six feet high and sixty-six inches wide along the top of which, at either side, is a steel rail, 16 or 20 pounds to the yard, upon which the wheels run. A reciprocating motion of about five feet is given to these tables by shaft and gears driven from the power house.

Below the channels are located the carbon-black collecting hoppers, which are spaced four feet apart. From them the carbon-black falls into the conveyor that takes it to the bolting and packing house. In these hoppers is arranged the scraper that removes the carbon-black from the channels. There are two classes of scrapers in use; one of them removes the deposit continuously, and the other removes the deposit while the table moves in one direction only. The latter is preferable because it gives a more uniform grade of carbon-black.

Between the hoppers are located the burners. These consist of a ¾ inch pipe into which are set 8 to 10 lava tips. One burner is placed beneath each channel, parallel to, and about four inches below it. The gas is distributed to the burners in such a manner that the flow is uniform to each table throughout the plant. Fig. 3 is a sketch of one of these channel system carbon-black burners.

The other parts of the plant are the same as those used in the rotating-disc process already described.

Plate Process

This process was devised by Godfrey L. Cabot in 1892 and is still being used at a number of plants, notably in West Virginia and Louisiana, although not to the same extent as the rotating-disc and channel systems. There are two modifications of this plate process, both of which employ plates 24 feet in diameter. In one case the plate is stationary while the burners and scrapers revolve beneath it; in the other the burners and scrapers are stationary and the plate revolves. The first method is that most commonly used.

The plates consist of 48 iron segments, arranged in two rows, 16 in the inner and 32 in the outer. These plates have holes in them through which the products of combustion can escape and which enable a draught to be maintained. The plate is supported by a cap, shaped like a truncated cone, resting upon the top of a hollow mast, a series of guys connecting the cap with the outer edge of the plate, the centre of the plate being held in place by a collar secured to the mast. Around the plate is erected a sheet-iron building 26 feet in diameter, and above each is a roof made of corrugated iron that extends about two-thirds of the distance up the mast, leaving in the centre an open space through which the gases of combustion can escape.

The burner consists of about 50 pieces of 1¼ inch pipe set at equal distances apart and extending from the mast to the outer edge of the plate. In these pipes are placed the lava tips, of which there are 1,265 under the entire plate.

The scrapers and collecting box are placed radially on the mast beneath the plates, and in a space between the burners provided for that purpose. From the collecting box the carbon-black falls into a conveyor located on the floor at the base of the mast, by which it is taken to the bolting and packing house, as in the other processes already spoken of.

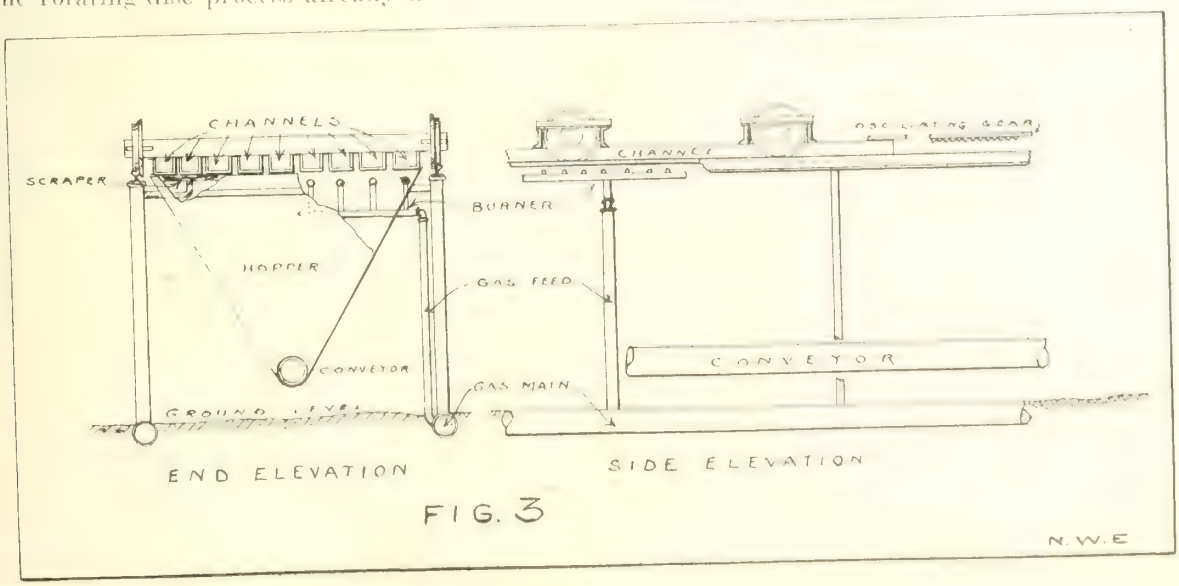

FIG. 3

Roller Process

This process was first tried out in 1883 by its inventor, E. R. Blood, with indifferent success due to the small amount of carbon-black recovered. Later, improvements were made in the process whereby the yield was increased somewhat and a market found for the product, which has properties peculiar to itself that are not obtainable in carbon-black made by any other system. The highest grade of carbon-black made at the present time, which is utilized in the manufacture of special inks for use in lithographing, embossing and half-tone engraving, is made by the roller process, even though the yield per thousand cubic feet of gas burned is materially less than that of the other systems.

The rollers used in this process as the surface upon which the carbon-black is deposited are 8½ inches in diameter and made in three sections, each of which is three feet long. These are set end to end upon a shaft 1½ inches in diameter to which they are keyed, thus making the completed roller nine feet long. When these rollers are made from cast iron, they are machined on the outside so as to present a smooth surface to the flame. In some factories extra-heavy casing or pipe is used, in the place of the cast iron, into the ends of which a spider is fitted to carry the shafting. This arrangement has proved very satisfactory and no trouble has been experienced from warping or scaling of the pipe due to the heat. The burner consists of a 1¾ inch pipe set about five inches below and parallel to the roll, in which are placed the lava tips through which the gas passes to the flame. These lava tips have a round opening instead of the slit as in the burners used in the other processes, resulting in a round flame instead of a fish-tail.

The scrapers for removing the carbon-black deposit are put near the top of the rollers, parallel to and running their whole length. They are in contact with the rollers all the time and scrape continuously.

The rollers are operated in batteries of three enclosed in a sheet iron casing, the lower section of which is V-shaped and acts as a collector for the carbon-black removed by the scrapers. Along the bottom runs a spiral conveyor that takes the product to the packing house. The top of the sheet-iron casing is in the form of a removable hood in which are holes to serve as means of escape for the products of combustion. Fig. 4 is a sketch of one of these batteries.

Each building contains 32 of these batteries of rollers arranged in two rows of 16 each, and eight to ten such buildings constitute a unit.

The rollers are revolved by a gear held by a set screw on the end of the shaft. This gear is operated by a worm on the main drive-shaft that runs the entire length of the building and delivers power to each battery. The speed at which these rollers revolve is governed by the grade of carbon-black being made; it ranges from 15 to 45 minutes per revolution.

The bolting, packing, and other details of the plant are the same as those used in the other processes.

Conditions Affecting Operation

The efficiency of a plant for the manufacture of carbon-black depends upon its general design; the lava tip used; the distance from the depositing surface to the top of the lava tip; the control of the air admitted to support combustion, and the speed of movement of the depositing surface. This last affects the quality of the carbon-black produced rather than the quantity. The proper distance between the burner and the depositing surface depends upon the gas being burned, no two gases being the same in this respect. The gas from some fields in West Virginia requires a distance of three inches between burner and depositing surface, but this distance is entirely too long for the Louisiana gas.

Weather conditions also play an important part in the output of a plant, as wind cuts down the yield by causing the flames to flicker and prevents the steady, quiet, smokey flame so necessary for good work. Heavy rains are apt to cause trouble by wetting the carbon-black, the water leaking into the conveyors, burner buildings, etc., and causing the carbon-black to cake.

The presence of salt water or sulphur in the gas causes trouble because the salt crystallizes, and the sulphur is deposited on the burner tip causing the flame to fork and so interferes with its even distribution over the depositing surface; also the amount of gas passing through the burner is lessened. The pressure at which the gas is fed to the burners is also an important matter and should be closely regulated; it

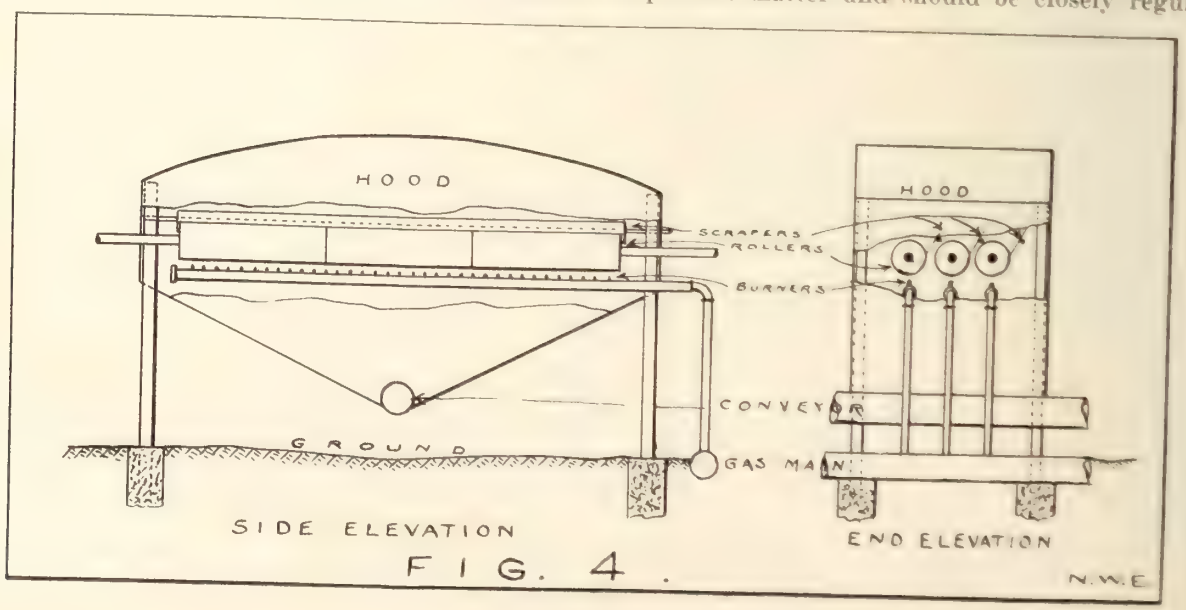

FIG. 4.

ranges from two-tenths of an inch to one and one-half inches water pressure.

Cost of Operation

The cost of operating a carbon-black plant of the small disc, channel or plate type, exclusive of the cost of the gas burned, but taking into account labor, sacking, re-sacking, supplies, and depreciation is $1.00 to $2.50 per hundred pounds of carbon-black produced, (in the United States), the lower figure being that of the big plants. Depreciation is taken at 10 per cent. per annum. A plant having a capacity of 6,000 pounds of carbon-black per day operating in east central Alberta would have a production cost of about $2.25 per hundred pounds, exclusive of the cost of the gas, but inclusive of all the items above mentioned, and making allowance for an increased cost for labor and supplies over the prices paid in the United States.

Natural gas when burned in an atmosphere deficient in oxygen is only partly consumed; the balance of the gas is decomposed by the heat of the flame and the carbon is liberated. If the heat required to decompose the gas can be supplied from some other source, or if the heat obtained from the complete combustion of part of the gas can be applied to another part of it in a more efficient manner than is now obtained in the commercial carbon-black plants, a better recovery can be made.

Attempts to Increase the Yield

Working along this line many experiments have been tried but the resulting product has been of no commercial value because it lacked the valuable properties peculiar to carbon-black, even though recoveries were made as high as ten pounds of carbon from each thousand cubic feet of gas burned. At the present time one of these thermal decomposition processes is being used in connection with the manufacture of hydrogen from natural gas; the carbon formed is of no use and is discarded.

The Bureau of Mines of the United States has carried out a series of experiments with a view to developing a process for the manufacture of carbon-black from natural gas by means of the high voltage arc. The experiments consisted in passing natural gas through an electric arc, the heat of which decomposed the gas and liberated the carbon. While the experiments were very interesting and carbon-black recoveries as high as 6.4 pounds per thousand cubic feet of gas were made, the current consumption was high, ranging from 41 to 94 k.w.h. per pound of carbon-black. In the report on these experiments the following interesting statements are made:

"The amount of carbon-black recovered per unit of volume of gas treated, varies with the current, rate of gas flow and type of apparatus.

"The carbon recovered varied with the rate of flow; the slower the rate of flow, or the longer the gas is exposed to the arc, the greater the percentage of carbon recovered.

"The carbon recovered also varies with the current; the temperature of the arc being a function of the current. As the current is increased, evidently as a result of variation in the temperature of the arc, the carbon yield per unit of volume of gas is increased; this relationship holding within certain values. No carbon is formed when the current is decreased below a certain minimum value. Increasing the current flow produces an increased yield of carbon, but a point is soon reached beyond which an increase in current is accompanied by only a slight increase of black". (From Report of Investigations, Bureau of Mines, Washington, D.C., Serial No. 2417.)

Opportunity for Improvement and for Research

Improvements in the present commercial plants can be made by changing the design so as to reduce construction costs, by making them independent of weather conditions, especially wind, and by the regulation of the air admitted to the burner buildings, which should be more effectively controlled. Such improvements will result in a lessened cost of production and a higher percentage of yield.

The most promising line of research for a process that will give a greater yield of carbon-black from natural gas seems to be thermal decomposition, if means can be found for getting the liberated carbon away from the heated zone as fast as it is liberated, and if the depreciation of the apparatus can be kept within reasonable limits. In such a process the hydrogen liberated could be compressed in tanks and used with the cutting torch, or for the hydrogenation of oils. This problem is well worth the attention of the physical chemist and of the research departments of our Universities and of the laboratory of the Department of Mines at Ottawa.

Some natural gas contains helium, and both methane and ethane can be converted into other products besides carbon-black. These matters will be dealt with in a succeeding article.

"MINING" SULPHUR WITH HOT WATER

The current issue of *Compressed Air Magazine* contains a description of the French method of "mining" sulphur, as used in Texas and Louisana. The method consists essentially of melting the sulphur in the ground by means of hot water, and of pumping the molten sulphur to the surface. To melt the sulphur, water, at a temperature of approximately 330 deg. F., is pumped down into the sulphur-bearing strata lying 1,000 feet or more below ground. As the temperature of the water is practically that of steam at 100 pounds pressure, the water has to be heated and kept continuously under that pressure lest some of it be converted into steam. The water is therefore pumped under the aforementioned pressure into especially designed heaters, where it comes in direct contact with live steam at the same pressure.

After heating, the water is fed to pumps which increase its pressure from 100 pounds per square inch to such a pressure as may be required to force it into the sulphur well—usually from 150 to 200 pounds per square inch. These booster pumps discharge the high-pressure hot water into covered pipe lines which are run from the heating plant to the various sulphur wells scattered over the producing area. One water heating plant may serve as many as half a dozen wells.

The piping leading down into each well is made up of several pipes, ranging from one inch to ten inches in diameter, placed one within the other. The outermost pipes carry water down to the sulphur-bearing strata, where it passes out of the piping through perforations. Within the water pipes, which are six and eight inches in diameter, is a 3-inch line extending to the bottom of the well. The sulphur, as it melts, flows to the bottom of the well and is raised through this line to the surface of the ground by means of compressed air fed through a 1-inch pipe within the 3-inch line. The wells are over 1,000 feet deep.

Letters From Readers

"Not Guilty"

To the Editor,
Canadian Mining Journal;

In a recent issue of the *Journal,* Mr. C. M. Campbell upbraided the daily press and technical journals of Canada for their silence with regard to the late J. D. MacKenzie's report on "Coal Resources of Southern Vancouver Island," which, according to Mr. Campbell, was issued by the Geological Survey on the first of June.

As Mr. Campbell's article was the first intimation I had received that the report had been published, I wrote at once to Ottawa for a copy, and, in reply, received a letter from Mr. Wyatt Malcolm, chief of the division of geological information, stating, among other things: "I am afraid the statement in the *Canadian Mining Journal* has led to some misunderstanding about the status of the report. It has not been published. We had a few copies mimeographed for persons very directly interested, (presumably the managers of the collieries on the island.) It will not be until the report is published that we will have a stock for general distribution."

Under these conditions it is hardly surprising that the press—technical and daily—has had nothing to say on the matter.

Victoria, B. C. F. H. Mason.

Mr. Campbell Discusses Induction and Deduction

To the Editor,
Canadian Mining Journal,

A natural action after reading Dr. Corless' letter on the above subject is to find out to what extent Dr. Corless' published statements agree with the rules he refers to.

The whole matter is summed up very briefly in the *Britannica* as follows: "Induction normally leads, not to a necessity, but to a *probable* conclusion; and whenever its *probable* conclusions become deductive premises the deduction only involves a *probable* conclusion.*" The italics are my own.

Let us now take Dr. Corless' conclusion that it is a "fact" that "we have inconceivable wealth in minerals." This was based on several premises consisting of so-called facts and inductions.

These premises need not be again discussed here. Even had Dr. Corless been right in his facts and even had his inductions been warranted, his conclusions would only have been a probability. In stating it as a "fact" he violated the rules of logic. The article from which I quote says that the degree of probability is variable and that at times conclusions rise to the point at which probability becomes moral certainty. The reverse however, is the case in this instance. Considering the grave errors in his premises, Dr. Corless' conclusion is nothing more than an extreme possibility and as such should never have been published.

The same authority** states that induction "is a scheme invented to meet a given situation, an hypothesis which is put to the test of events and is verified or refuted by practical success or failure." I venture to say that Dr. Miller when studying the relationship of the silver ore to the neighboring rocks discarded many inductions before he found one that stood up before every test. I venture to say, also, that Dr. Corless in trying out his deductions did not always have the good fortune indicated in the incident of the Garson mine.

I quite agree with Dr. Corless that an engineer should try to see beyond the ore he has blocked out; but before that engineer states a conclusion, in regard to local or national mineral reserves, as a "fact," it should be put to the test and verified; in other words the mineral should be actually blocked out.

Dr. Corless, I have said, believes that it is a "fact" that "we have inconceivable wealth in minerals." He then made the induction that every member of the Institute believed the same thing. Before going any further he should have put that induction to a thorough test. Instead, he made the same mistake as Richardson and Clapp on Vancouver Island. He jumped to the conclusion that his induction was a fact; that the measures were productive everywhere; or in other words that the members were unanimous; and therefore he signed the Institute's name to his claim. Here again he violated the rules.

I would like to ask Dr. Corless two questions. First, does he still believe that it is a "fact" that "we have inconceivable wealth in minerals?" Second, does he still believe he was justified in signing the Institute's name to a statement of that sort?

It is this habit of stating as a fact what is only a possibility that has got us into the mess we are now in. I have referred in a previous letter in this *Journal* to present conditions in British Columbia. A recent official statement says that the deficit on account of the Pacific Great Eastern alone now amounts to $3,000,000 per year. This road would not have been built if the public had not been hypnotized by such extravagant statements as Dr. Corless has issued in the name of the Institute. To pay this money we have to sacrifice many things that a community holds dear and many things that to touch would ordinarily be called sacrilege.

At the present time Vancouver is so badly in debt that to make her budget balance she has to curtail the education of her children. By-laws to improve fire protection are always defeated and, as a direct result, in the last few weeks lumber mills valued at $350,000 have burned down. Notwithstanding shortage of water in the summer, a large lumber concern is logging in the watershed from which she derives her water supply. Vancouver had, originally, one of the finest natural settings of any city in the world; yet, with the exception of Stanley Park, all the nearby roads have been denuded of their beautiful groves of trees.

On the strength of "inconceivable wealth" Victoria plunged with the rest, and that city is now notorious as having the largest per capita debt, even after allowance is made for utilities, of any city in the Dominon—and that is some record. On its outskirts are the Outer Wharves, a monumental piece of extravagance, built some years ago at a cost of about $5,000,000. Interest has nearly doubled that figure, and this interest we are all paying and shall continue to pay. Recently I stopped there. There was one boat in the harbor—the one I was on; the piles were rotten, the sheds were empty and the streets nearby were covered with grass. The wealth that was to make this a busy spot has not materialized. Notwithstanding hard times and the need of economy, the Federal Government, with the record of these wharves before it, has plunged again and voted more millions for the construction of a magnificent dry dock which is now being built.

Belief in inconceivable wealth of natural resources is the worst thing that has ever cursed this country and I shall denounce it, and the logic that makes Canadians believe in it, whenever I am given the opportunity.

Cassidy, B. C. C. M. Campbell

* Encyclopedia Britannica, Vol. 16, p. 880 d
** Ibid, Vol. 14, p. 502 b.

Mineral Resources along Hudson Bay Railway and round Hudson Bay

Summary of Information by Natural Resources Intelligence Service

The Natural Resources Intelligence Service, Ottawa, have lately prepared for distribution to those interested a 35 page mimeographed memorandum, with a blue print map, from which the following, relating to the mineral industry, is extracted. Its purpose is to give a brief synopsis of the important available information concerning the resources of that portion of the country lying adjacent to Hudson Bay, and the Hudson Bay Railway in particular. It has been compiled mainly from reports of exploratory parties and from data contained in federal and provincial Government publications. In a few instances information has been procured from unofficial sources and its accuracy cannot be guaranteed.

Physical Features

The district adjacent to the partially constructed Hudson Bay railway lies almost altogether in Manitoba and is roughly bounded on the southwest by the Pasquia hills, on the northeast by Hudson bay and on the southeast and northwest by the Hayes and Churchill rivers respectively. This represents an area about 160 miles wide and 450 miles long, some 70,000 square miles in extent.

The district is drained by three rivers flowing northeast to Hudson bay by parallel routes and traversing regions similar in type. The Nelson river is the central and largest of these, the other two being the Hayes and the Churchill, as previously mentioned. The Saskatchewan, another large stream indirectly feeding the Nelson via lake Winnipeg, flows east across the southern limits of the belt between the Pasquia hills and the Nelson height of land.

The whole region is in low relief, the hills being seldom more than 200 feet high and the central slopes being 400 and 500 feet above sea level. The highest point along the railway is Elevation 962', at a point 60 miles northeast of The Pas. Much of the country between the Nelson and the Churchill rivers is of very gentle gradient, both locally and as a whole. Geologically the district is arranged in three general belts crossing the rivers at right angles of which the middle and most widespread division is part of the great Laurentian plateau, here 250 miles wide (as measured along the railway) with Pre-Cambrian crystalline rocks deeply covered by clay soils. South of it is a tract about 60 miles in width lying on flat limestone formation (Ordovician) thinly covered or bare of soil and draining southward to the Saskatchewan river. The Saskatchewan valley is confined towards the south by a series of escarpments of which the Porcupine mountains, Pasquia and Wapawekka hills form the prominent features, and which constitute the northern boundary of the Great Plains regions in this vicinity. Between the Laurentian and the Ordovician are outcrops of Huronian and Keewatin rocks, which are a mineral bearing series. North of the Laurentian, for 125 miles inland from Hudson bay, is the third geological belt consisting also of limestone formations (Ordovician with overlap of Silurian) with a wet clay and gravel subsoil and surfaced with mosses and frozen bog. It is believed that much of this district sometimes known as the Arch-Hudsonian swamp, was previously occupied by sea waters which have now receded and are still receding slowly. The shores of Hudson bay on both sides of the Churchill are low and of such flatness that the tides cover them in places for several miles inland.

Hudson Bay

Hudson bay, into which the waters of these flow, is a great inland sea 900 miles north and south and 500 to 600 miles east and west extending deeply into Manitoba, Ontario and Quebec from the North. It is connected with the Arctic ocean by Fox channel and the Gulf of Bothnia and with the Atlantic Ocean by Hudson strait, a passage 500 miles long and from 45 to 100 miles wide, with deep water, few islands and pronounced shore lines furnishing good harbours on both sides. Due largely to the actions of the tides which in places are very high, 30 to 40 feet, and very strong, 6 to 7 miles per hour, the strait never freezes over but is the scene of many ice collections which come from down through Fox channel and to a lesser extent from Baffin's bay. he west shore south of Churchill and for 150 miles north is low, flat and without harbours; 200 miles north the coast becomes more rugged with inlets, harbours and islands. The east coast is irregular and bold with numerous islands and reefs. Pre-Cambrian rocks, largely granite and granite-gneisses, form both west and east coasts while the south shore from Churchill to James bay is made up of Palaeozoic limestones with Pre-Cambrian rocks further inland.

James bay, the southern extension, is 250 miles long, 120 miles wide and about 30,000 square miles in area. It is shallow for the most part, but deep water may be found well out from the west shore.

Many of the islands of Hudson bay are large and possess latent mineral and other resources.

Climate

Except for the summer months the climate of Northern Manitoba and adjacent districts of Ontario is several degrees colder than the northern agricultural belt of Saskatchewan and Alberta. Nevertheless it is by no means disagreeable. The daily hours of summer sunshine are long (about 18), and the low absolute altitude is favorable to early maturity of field crops. The winters are severe but exhilarating. Precipitation averages about 17 inches of which one-third falls as snow. The maximum distribution is in mid-year with a tendency for the wet season to extend through September.

Agriculture

Some settlement has been made in the Saskatchewan valley and along the routes of travel but it cannot be said that the agricultural future of the country has been accurately determined as yet, despite the fact that success has been met in a small way. At the same time prospects are by no means discouraging. The extent of arable soils is known to be considerable; rainfall is sufficient and well timed; and summer temperatures as recorded at The Pas and Norway House are

exceedingly favourable to fast growth and early maturity of field crops.

Water Powers

Enormous quantities of hydraulic power are within transmission distance of the railway belt, the Nelson river alone being capable of almost two and a half million horse power at ordinary minimum natural flow.

In connection with the proposed smelter at the Flin Flon mine it will be necessary to obtain power either from the Churchill, Saskatchewan or Sturgeon-Weir rivers. The Scoop Rapid site on the latter is most favoured.

Of the other rivers flowing into Hudson and James bays it may be generally stated that those draining from the west are of gradual descent in their lower reaches and possess few falls of consequence within economic transmission distance of tide water, while those coming from Quebec territory possess important power sites, many at or close to the coast. From present sources of information the Eastmain, Rupert Nottaway and Great Whale rivers are capable of furnishing about three quarters of a million horse power at ordinary minimum flow. Nastapoka falls, adjacent to the Nastapoka iron fields, has a descent of 170 feet and theWyachuan river has a fall near Richmond gulf of 315 feet and the Langland river one of 60 feet near its mouth.

Uses for this power have not been developed as yet, but three logical industries, all of which depend on cheap power in large quantities, suggest themselves - 1. Smelting of copper and iron ores in electric furnaces. 2. Production of fertilizers by fixation of atmospheric nitrogen. 3. Pulp and paper enterprises.

Minerals

The most outstanding mineralized area yet discovered in these parts is a belt 125 miles long and 20 to 40 miles wide extending east and west from Herb lake Manitoba, to Amisk lake, Saskatchewan, and crossing the Saskatchewan-Manitoba boundary just south of latitude 55 degrees. This is known as "The Pas Mineral Belt". The geology which characterizes it. Keewatin (including Huronian) formations between the limestone and Laurentian rocks (granites), is carried much further and has been traced in a general way east as far as God's lake, Hayes river, and west to Lac La Ronge, Churchill river. This is similar formation to the mineralized portions of Northern Ontario.

Gold and copper are the outstanding discoveries so far, and, while production was attempted for a while, lack of capital in the one case and falling markets in the other resulted in the closing up of active properties till such time as power and transportation could be obtained and metal prices had recovered. The existing active camps beginning at the interprovincial boundary and going east are:

1. Flin Flon and Schist Lake camp
2. Athapapuskow Lake camp
3. Elbow Lake camp
4. Herb (Wekusko) and Little Herb Lake camp.

The mineral formation as outlined by R. C. Wallace, Commissioner of Northern Manitoba in 1919, is made up of three classes grading into one another.

1. Gold in quartz veins carrying sulphide.
2. Copper-zinc-iron sulphide bodies.
3. Iron sulphide bodies.

Due chiefly to difficulties of transportation, the mineralized sections of the more general Hudson Bay district have received very little attention. Doubtless with rail communication with Port Nelson, Churchill or one of the James Bay ports much additional prospecting and development work will ensue. Of the islands to the north only a cursory examination of limited and coastal regions has as yet been attempted, although coal, iron, copper, gold, silver, lead and other minerals have been reported by explorers.

The following references summarize briefly the various native minerals of the railway belt and Hudson Bay coasts and their reported occurrences:

Antimony

Stibnite (antimony sulphide) is associated with the galena deposits north of Little Herb river, but to no great extent.

Anthraxolite

A bituminous mineral with the lustre and colour of anthracite is found in irregular veins or globules on Long island. It is not of economic value due to the small size of the occurrence and the high silica ash residue on burning.

Amber

This fossil resin is thrown up by waves on the shores of Cedar Lake just south of the entrance of the Saskatchewan river in small broken pieces the size of beans. The amber is believed to be derived from the Tertiary or Cretaceous lignites occurring on the Saskatchewan. Its use as a filler in the manufacture of varnish has been suggested, but the present supply appears too uncertain and inadequate for any commercial development.

Arsenic

Arsenical pyrites (mispickel) is present in a diabase sill on an island in the Nelson river in the Pipeston Lake area, also on some of the Wekusko lake properties and south of Corbett inlet, Hudson bay.

Asbestos

Small veins of asbestos are known to occur south of the Little Whale river, on the Ottawa islands, Hudson Bay and on an island in Lac LaRonge, Churchill river. J. B. Tyrell reports a deposit of possible value on Cross lake, Nelson river, on the Indian Reserve island, while another discovery is alleged to have been made near Amisk lake, Saskatchewan.

Building and Ornamental Stone

Large quantities of magnesian limestones for quarrying are exposed close to the railway in the vicinity of Cormorant, Reed and Atikameg lakes. This stone could be taken out in blocks 1 - 5 feet thick and in all sizes and would prove an excellent stone for structural purposes. The granites on the Grass river below Reed lake are well coloured and seem of a type suitable for dressing and polishing. This stone can also be obtained near Grand Rapids. Black marble suitable for quarrying has been reported by propectors working northeast of Amisk lake. Building materials of fair quality is found at Churchill. A variety of building stones are found on the islands and mainland of Hudson Bay betwen the Great Whale and Nastapoka rivers. On Walrus island of the Paint Hill group is found a porphyry rock holding pearly crystals of feldspar set in a dark green ground mass. Large slabs of this rock could be obtained for interior or exterior decorative uses. Agates, carnelians, epidosites and porphyries suitable for polishing can be obtained between Manitounuck and Nastapoka Sounds.

Clay

Clay suitable for brick manufacture occurs over a wide area, from Setting lake to Armstrong lake (100 miles), in the valley of the Limestone river, in local depressions in the boulder clay, and just north of Manitou rapids, Nelson river. The more calcareous clays are to the south. All are free from pebbles and could be burned to commercial hardness at 1,800 degrees. F.

Cement and Lime

The magnesian limestones which extend across the railway belt just north of the Saskatchewan river are suitable for burning for lime, while the upper portion of the series of the highly calcareous bituminous shales underlying the Pasquia hills can be used in the manufacture of cement. The pure dolomites of the Manitounuck islands would make excellent lime and cement materials, while a possible hydraulic cement stone is said to occur on Belanger, White Bear and the Nastapoka islands.

Coal

A sample of lignite received by the Mines Department, Ottawa, in 1907, described as from "an unsurveyed area northwest of Cumberland lake, Saskatchewan", showed the following analysis: moisture 13.25%, volatile combustibles 28.97%, fixed carbon 24.80%, and ash (including sand) 23.00%. This was probably a continuation of the lignite deposits of Lac La Ronge and Wapawekka lake, Churchill river. Lignite is also found on some of the Ontario rivers reaching James bay. Discoveries of lignite in the Pasquia hills have been reported but not verified. Stefansson, the Arctic explorer, says that he has seen coal in nearly every island north of Canada.

Cobalt

Cobalt has been seen in the form of fine-grained smaltite and cobalt bloom east of Big Island lake, and occurrences are also noted in calcite veins on the Belcher islands but not in economic quantities.

Copper

Copper sulphides of large extent and varying richness occur in The Pas Mineral Belt between the Saskatchewan-Manitoba boundary and the Grass river.

From the Mandy mine, Schist lake, 26,000 tons of ore have been mined and transported by waggon, barge and railway to Trail, B. C. for treatment. This ore contained 19½% copper with gold and silver values. 180,000 tons are now blocked out, the estimated content being 6% copper, 20% zinc and values in gold and silver.

The Flin Flon mine is the largest known commercial ore body in the province, 16,000,000 tons having been blocked out by diamond drills, shafts and drifting with the following estimated average values: gold .081 oz. per ton, silver 1.17 oz. per ton, copper 1.88%, zinc 3.80%. As will be seen this is a low grade deposit and will have to be handled in a large way with a small margin of profit per ton. Development involves building of an 85 mile, $2,500,000 (estimated) railway from The Pas to the property, harnessing of 10,000 hydraulic h.p. on Sturgeon-Weir river or Churchill river and the construction of a light railway from Flin Flon lake to the power house, the erection of a smelter on the property of 2,000 tons daily capacity and the establishment of a townsite for a population of 3,000 to 5,000. Fluxes could be obtained within about 15 miles or so, while the nearest suitable coal would be in Alberta.

Electric smelting, a new metallurgical practice for the treatment of copper ores, has been considered in connection with the Flin Flon owing to the high fuel costs, enormous water powers being within transmission distances of the mines. The Bureau of Mines of the United States made experiments along these lines, though not on an industrial basis, which tended to show that with the cost of electrical energy at $16 per Kw. year and coke at $9 per ton the cost of the two processes would be about the same.

Other occurrences are at the mouth of the Pineroot river, at Thompson and Twin lakes, all near Athapapuskow lake, at Pipestone lake, East river, between lake Winnipeg and the Nelson. Some development work has also been done at Elbow, Copper and Little Herb lakes.

There are Huronian rocks on the main land of Hudson bay at Cape Fullerton north of Chesterfield inlet containing 4% copper pyrites, and chance specimens showing small quantities of nickel and copper have been picked up northward of Portland promontory in the vicinity of Mosquito bay with promising indications of sulphide ores in the form of pyrite, pyrrhotite and chalcopyrite.

Iron and copper pyrites are reported at various points on the east side of Hudson bay and chalcopyrite, occurring in metamorphosed limestone, has been noticed on the Belcher islands but not in economic quantities, and in the vicinity of Lac La Ronge, Saskatchewan.

Flux Material

Limestone suitable for flux can be obtained in quantities from the lake Winnipegosis region and could be delivered by barge to The Pas from a point a few miles from lake Winnipegosis via Cedar lake and the Saskatchewan river. The question as to where this material can be got to best advantage for the Flin Flon enterprise, is not as yet definitely settled.

Silica can be obtained from the numerous quartz veins in the mineral belt, most of which carry gold values. This gold would be recovered in the metallurgical treatment of low grade copper ores such as the Flin Flon mine possesses.

It is estimated that if the owners of the Flin Flon property built a 2,000-ton mill, a daily charge of over 320 tons of quartz and 660 tons of limestone would be necessary.

(To be continued)

Electric Lamps

The General Electric Company investigated the properties of Tungsten, and, by the use of a few hundred pounds for electric lamps, a saving of $250,000,000 annually is made in the United States alone.

Aluminium

Aluminium was discovered by a German chemist, and originally cost $90 a pound, but at this price its discovery was of little value to the public. It is now manufactured at Niagara and Shawinigan Falls, and the scientific work done by Hall and Heroult has reduced the cost to 22 cents.

PERSONAL AND GENERAL

Sir Alfred Mond is to inspect the Mond Nickel Company's mines and smelter in the Sudbury district before returning to England.

Dr. J. Austin Bancroft has returned to McGill University from British Columbia, where he spent the summer examining mining properties in the vicinity of Anyox on behalf of the Granby company. Most of his time was devoted to the Maple Bay properties, of whose future he is very hopeful.

Capt. George Black, M. P. for the Yukon, left Dawson on the last boat of the season. The summer has been exceptionally long, and fine crops of vegetables and hay have resulted.

Mr. E. W. Beatty has announced that two large, new vessels will be added to the British Columbia Pacific coastal fleet of the Canadian Pacific Railway. The rapid growth of the mining industry along the coast, as well as the attractions of the coastal trip to tourists, has crowded the present fleet with traffic.

Mr. Louis P. Collin has been appointed ceramic engineer at the Mines Branch, Department of Mines, Ottawa. Mr. Collin is a graduate in ceramics of Alfred University, which has one of the principal ceramic schools in the United States. He has had a thorough practical experience in various lines of ceramic work, and at present is in southwestern Ontario studying some difficulties of brick manufacturers.

Dr. B. R. MacKay has been appointed geologist on the Geological Survey, Ottawa, to work on coal in collaboration with Dr. Dowling, Canada's veteran coal specialist. Dr. MacKay recently concluded an engagement with an English petroleum company in India, and was successful in locating a prospective oil field as a result of a refined study in sedimentation. A large appropriation has been made to test this field.

Dr. T. L. Tanton has returned to Ottawa on completing his season's field work in Thunder Bay district, where he made a detailed geological map on a contoured base of the old silver area. The Loon Lake iron ore deposits, which are in this vicinity, have been diamond-drilled during the past summer by the M. A. Hanna Company who operate mines, also in the Animikie series, on the Gogebic range in Minnesota. Dr. Tanton was accorded the privilege of examining the diamond-drill cores in Duluth, and also examined the M. A. Hanna mines on the Gogebic range, immediately following his examination of the Canadian deposits in the Animikie.

Dr. W. E. Cockfield has finished his field work for the year in the Yukon. He reports a successful mining season at Keno Hill, while all indications point to an even more successful year during 1924. During the summer he made a brief examination of some new silver-lead deposits on Beaver River, a tributary of the Stewart, 50 miles north of Keno Hill. This ore he found to be of comparatively low grade, and hence of no immediate commercial value. It is very interesting, however, as indicating the wide area over which this silver-lead ore occurs.

During the past summer Dr. D. B. Dowling has made an examination of the coal measures in the Bow River valley, south of Canmore, B. C., with a view to locating coal that would be completely suitable for shipment to Ontario as household fuel. The coal of the Bow River valley is much like Welsh anthracite, with fixed carbon from 75 per cent. as at Canmore, up to 80 or 82 per cent. as at Bankhead, and only two or three per cent. of ash. It breaks up, however, on exposure to the weather, due to intense folding of the coal seams. The area Dr. Dowling examined last summer has not been thus folded, and if the analyses of samples should show the quality to be first-rate, as it is elsewhere in the vicinity, it is quite possible that it will provide the best coal in the West for shipment to Ontario.

Messrs. James J. Hill and H. G. Pickard of the Haileybury High School are doing good work for the mineral industry, as is shown by a recent encounter in the woods. A well-known geologist ran across a young prospector in the gold belt of northern Quebec, and found him remarkably well equipped with the scientific lore of his calling, and most adept in applying it in practice. After a few days it developed that this young man was a graduate of the Haileybury High School in mining.

Dr. George Hanson, accompanied by H. C. Gunning and R. H. B. Jones, of the Geological Survey of Canada, have left Stewart, B. C. for the south after having completed a season's survey work in the Salmon River section of the Portland Canal district.

Mr. F. D. A. Vincent, of the firm of Vincent & Co., London, who is heavily interested in the B. C. Silver Mines Ld., whose property adjoins that of the Premier Gold Mining Co., recently visited the Portland Canal mining camp and made a personal inspection of the property in which he and his associates have invested.

Mr. D. J. Williams, manager of the Hirst Chicagof Mine, Alaska, has been inspecting a number of prospects in the Portland Canal district.

SOUTH AFRICA'S GOLD ORE RESERVES

In a recent number of the *South African Railways and Harbours Magazine*, Mr. H. C. Hopkins observes as follows:

Gold mining is said to have reached its zenith in South Africa. This, in Mr. Hopkins' opinion, is still a debatable point, and is dependent apparently upon the maintenance of working costs within economic limits. Continuous research work produces new ideas, and with constantly improved and cheapened methods of extraction it seems probable that huge quantities of ore of low gold content, now untouched, may be brought within the limits of payability. Improved and cheapened methods of treatment will also attract capital for the development of other known large gold fields which are still unproclaimed and unworked. The Government Mining Engineer has estimated that there are still available 440 million tons of ore which will yield between 3 and 4 1-2 dwt. of gold per ton, in addition to 340 million tons carrying 4 1-2 dwt. and over.

It may be that manufacturers overseas have been deterred from investigating the potentialities of South Africa through a fear of the decline of gold mining; but let them ponder well the foregoing, and if they will also consider the progressive activities in other forms of mining—coal, iron, copper, tin, silver, mica, asbestos, corundum, lead, zinc, talc, manganese, nickel and oil shale—it will be apparent that long before gold mining has become exhausted other forms of mining may have filled its place. Yet further possibilities exist in osmiridium, platinum, vanadium, molybdenum and other rare metals which only await enterprising exploitation.

Selenium has been shown to be useful to vulcanize rubber, in place of sulphur, or admixed with it.

VALUABLE DATA FROM EXPERIMENTAL BLAST-FURNACE

The study of the reduction of iron ore in the blast furnace, that has been in progress for four years under the direction of the United States Bureau of Mines, at Minneapolis, and which has resulted in the successful development of an experimental blast-furnace by the bureau's metallurgists, has yielded data that may lead to important modifications in the present design of blast-furnaces. The Bureau of Mines engineers are able to make iron successfully in a small furnace stack only 20 feet high, and the tests show that a considerable part of the stack is inactive, so far as the reducing effect of the furnace gases on the ore is concerned, between the combustion zone and the zone near the top where reducion is actively going on. Since nothing happens in this part of the stack, if the same conditions hold true in commercial blast furnaces the present tall stack universally employed could be shortened, thus reducing cost of construction, and size and cost of equipment such as the blowing engines that drive the furnace. Further work is being pushed vigorously with the object of tying up the experimental results with those obtained in commercial furnaces.

This furnace, the only one of its kind in the world, had been regarded as impracticable by many leading iron metallurgists. It has a hearth diameter of 20 inches and a height of about 20 feet, and two successful runs have been completed with every operating detail under perfect technical control. With this furnace, which can be operated at comparatively small expense, the Bureau of Mines is now in a position to make a scientific study of the blast furnace process and to attack various problems, the solution of which should be of value to the industry.

Since the furnace is operated for obtaining information, special provisions have been made for taking observations. Openings introduced at five levels up the side of the furnace were provided so that the gas samples, samples of solid stock, and temperature and pressure observations could be taken as a means of determining the more important chemical and physical reactions occurring within the charge column. Work of this character is a continuation of the efforts of Ebelmen, Bunsen, Bell and other earlier investigators, to obtain data on the changes that occur in the smelting of iron ore as the descending materials, charged in the top, encounter the ascending stream of gas from the combustion or tuyere zone of the furnace. The blast-furnace process is known to consist of a series of inter-dependent reactions, and information concerning only the materials charged, the gas given off, and the products tapped from the furnace, is inconclusive. In order to make an effective study involving as many variables as are contained in the blast-furnace process, it is necessary that the investigators be able to change the independent variables at will without regard to commercial considerations. This can only be accomplished by means of an experimental furnace operated solely to obtain information.

With a furnace whose operation can be controlled and which will make pig iron, ferromanganese, and spiegeleisen, the Bureau of Mines is now in position to undertake a study of special problems. In co-operation with the University of Minnesota, a new furnace, designed by the bureau, will be constructed in the new Mines Experiment station now ready for occupancy. The problem of utilizing the low-grade manganese ores of the Cuyuna Range will be undertaken as soon as this furnace is completed. Facilities for handling materials, as well as for sizing, crushing and sintering them, are now available. It is believed that this study will eventually lead to useful information regarding:

(a) Utilization of non merchantable manganiferous iron ores,

(b) Furnace design from a metallurgical viewpoint,

(c) Fundamental data on the blast-furnace process,

(d) Combustibility of coke.

IRON FORMATION OF LAKE ST. JOSEPH

The Ontario Department of Mines has now issued Vol. 31, Part 8, 1922, a forty-page report by Dr. E. L. Bruce on the iron formation of Lake St. Joseph, on the border of Kenora, Thunder Bay and Patricia districts. It is accompanied by two geological maps of parts of Lake St. Joseph, that showing the iron formation being on a scale of one mile to the inch, while the second, to the east, is two miles to the inch. Dr. Bruce viewed the area from an air-plane of the Air Board at the end of the season (1921) and described this experience in a paper before the Canadian Institute of Mining and Metallurgy in March, 1922.

The rocks of the region consist, in general, of Keewatin rocks of both sedimentary and volcanic origin, intruded by granitic rocks. Iron-bearing beds occur near the upper part of the sedimentary group of Keewatin rocks. The outcrops of iron formation are extensive, but the content of iron is relatively low. Some of the higher-grade portions run 32 to 38 per cent. iron, with silica as the principal gangue material. There is little possibility of any enrichment in these beds, as in the Lake Superior field, as there have been fundamental differences in the life-history of the two cases. The beds in Ontario were covered up soon after their deposition, thus preventing the surface alteration that produced the ore-deposits of Minnesota and Wisconsin.

RECOVERY OF METALS FROM SLAG BY FLOTATION

An unusually suggestive statement by Dr. C. W. Drury of Queen's University, Kingston, relative to some research work he has conducted appears in the October issue of *Mining and Metallurgy*. Dr. Drury says:

"There is no question that attention will be devoted within the next few years to the recovery of metals from slag. Increased mining and smelting costs, along with lower metallic content of ores, will hasten the time when materials now considered as waste products will be regarded as a source of metal.

"The most suitable method of recovering metals from slags will do, no doubt, vary according to conditions and the value of the metal. In the course of some experimental work in this connection, the writer has made a number of tests. The slag consisted essentially of silicates of iron, lime, nickel, cobalt, and copper. In the tests the object was, first, to add the requisite and proper reducing agent which would reduce the nickel, cobalt and copper to metallic form. The reduced metal would not melt at the temperature of the molten slag. To recover and collect the reduced metallic particles, carbonate of lime or soda was added, with the result that a spongy mass came to the surface and was readily removed. Under certain conditions it was necessary to add basic material to the slag. In several tests a recovery approaching 90 per cent. of the nickel, cobalt and copper was obtained."

REPORT ON MINE TIMBER

The kinds of timber used in mining operations are as varied as the localities in which the mines occur, states the United States Bureau of Mines in Bulletin 215, just issued, as a result of a study of the timbering of metal mines just completed by the Bureau of Mines. In some districts in which there is a scarcity of good timber, such as in the Southwest, the prospector and small mine operator use the dwarf varieties usually found in these arid regions, such as mesquite, sage brush, juniper, cottonwood, pinon, etc.

Long-grained timbers such as pine, fir, spruce, oak, and chestnut are preferred because they will crack and split when pressure comes on them, and thus give warning long before they break. Although timbers should be long-grained, strong, and elastic, they should not be too heavy. Oak and chestnut and other long-grained hard woods are strong, but many hardwoods are heavy to handle. Short-grained woods are often unreliable as an indicator of dangerous pressure because they may break without warning.

The Bureau of Mines advises that the use of such flexible woods as hickory, eucalyptus, and willow be avoided, if possible, as they bend easily under pressure and do not offer, in proportion to their size, much resistance to the movement of the rock. The willow especially lacks both strength and durability.

Those timbers of the Pacific coast that are best adapted to mining uses are Douglas fir, California fir (white fir), Sitka and white spruce, and yellow pine (bull pine), but western hemlock, cedar, and redwood, also oak, maple, chestnut, and other hard woods are used where most easily available. Sometimes the scorched timbers of burned-over districts are used. When the heart of the timber is sound these have proved acceptable; they are cheaper than unscorched timber and are practically as strong.

In Alaska there have been many objections given to the use of native spruce and native hemlock for mine timber. Some mining companies have preferred to ship in Douglas fir from Washington and Oregon instead of using the native woods. At present the amount of Alaskan timber being used in the miines there are much larger than formerly. Experiments by the Forest Products Laboratory on Sitka spruce and Alaska hemlock indicate that the better grades of these woods compare favorably with lodge-pole pine and Douglas fir.

A fundamental principle to be kept in mind is that mine timbering should afford adequate support at least expense. Enough timber should be used to insure safety to the workings and to the men, but as timbering is often one of the chief items of cost in mining, the excessive use of timber an economic waste.

Timbering serves primarily, by the prevention of caving and spalling, to keep the workings open for such time as is necessary for extracting the ore, or for purposes of transportation and ventilation. When the workings are abandoned, the timber therein has fulfilled its purpose and is so much waste material, although some of it may perhaps be recovered for re-use in other parts of the mine.

Because timber suitable for use in mines is becoming increasingly scarcer in nearly all mining districts, and at many places must be shipped in, and because of the labor cost involved and the further fact that most mine timber can not be recovered, there is greater and greater need for exercising good judgment in utilizing timber to the best advantage.

The most important principle of mine timbering is to timber in time; that is, immediately after excavation and before the rock inside the natural rock arch becomes broken and begins to settle. If this principle is followed it will save time, money, and many lives.

The ventilation of a mine has considerable effect on the life of the timber. Damp stagnant air will cause mold and fungus growth which will be followed by decay or rot. All timbered active places in mines should be well ventilated, and special provision should be made for the removal of the damp, hot air which is commonly found underground in pumping stations and around steam lines.

Timbers used in mines are subject to destruction from decay and insect attack, breakage, mechanical wear and fire. It is estimated that under average conditions 50 per cent of the total timber used is destroyed by decay and insect attack. Decay and its accompanying evil, boring by insects, the most destructive agencies acting on underground timber, can be retarded by peeling and seasoning the timbers before use, and by treatment with a suitable preservative. While it may not always be feasible for the small mine operator to use preservatives, peeling and seasoning timbers is always possible. Bark, when left on the timber, retards the evaporation of moisture, leaving the timber more easily attacked by fungus growths and various wood-boring insects.

The average life of green, unpeeled, and untreated timber used in a mine is from one to three years; but by peeling alone, the life of timber when used in dry mine workings may be increased 10 to 15 per cent. There are several kinds of wood preservatives which have been used successfully on mine timbers—creosote, zinc chloride and sodium flouride are the ones most commonly used. The bark should always be removed from the timbers before treatment.

THE SUPERIORITY OF BRITISH CHINA CLAY

Foreign Deposits Reviewed

Dependent as the rest of the world has been upon the unlimited supplies of English china clays from Cornwall, it is, we suppose, only natural that other countries should seek to find, within their own borders, clays approximating in quality and chemical constituents to those they have been in the habit of importing. With rare exceptions foreign exploiters have failed to find anywhere else in the world any kaolins to equal the quality of the best English china clays, but they have succeeded in developing some clay deposits that are at least equal to the common china clays of the West of England.

In no countries are the efforts to find substitutes for our English clays so determined as in America and Canada. There is a lesson in this activity for English china clay producers, and it is for them to get busy to keep their "end up" across the water, where the maintenance of markets is of vital concern to the industry.

This can only be done, as has been frequently pointed out, by means of propaganda at least equal in energy and originality to that being undertaken by our friends across the water.

It is a matter of common knowledge that for some time past Americans users of this invaluable product have lately combined with a view of discovering other sources of supply. Up to the present it is a fact that only a relatively few deposits of good china clay of any commercial value have been found in the U.S.A., these chiefly being in the Southern States; but there

are, we believe, other important deposits being worked in Nevada, Colorado, California and elsewhere in America, but of much inferior quality to the British clay. It is now being pressed upon the Federal Government that a systematic geological survey should be undertaken with the view of ascertaining how far the U.S.A. can be made independent of imported supplies, and thus be in a position at least to compete with English china clays.

The Department of Mining recently despatched a special Trade Commissioner to China to investigate the subject, and the gentleman in question, Mr. J. Morgan Clements, has since reported that supplies of high-grade kaolin could possibly be obtained from that Republic after systematic exploitation. He particularly mentions the province of Fukien, which is more favourably situated to supply markets than those at Kiangshi, on the Yangtze, and at Shekwan, near Canton. Mr. Clements also directs the attention of the Department to the promising deposits which have been located, and are to-day being worked, at Foochow, near the South Manchuria Railway, the exports from which centre amount to something like 70,000 tons yearly. This, we may incidentally remark, is virtually the total quantity of china clay now being produced in Cornwall in one month. To assist in the development of this industry, it is proposed to link Foochow with the main line by a narrow gauge railway, an alternative plan being to connect the quarries with the coast, which is only about a mile distant. An additional promising field, producing high-grade clay in fair quantities, is situated close to Tumenling station on the Kirin Changchun Railway, the possibilities of which, we learn, are now being investigated. In all probability American capital and enterprise will be employed in the exploitation and development of these sources of supply.

Canada is at last likewise bestirring itself in a more systematic investigation of its china clay deposits, mainly with the view of developing its pottery industry. Up to the present, the only white clay discovered in the Dominion is at St. Remy D'Amherst, near Huberdeau, Quebec, 85 miles from Montreal. A number of unsuccessful attempts have been made to it, and a considerable amount of good clay produced. Other inferior clays suitable for the manufacture of pottery occur in Southern Saskatchewan. The D'Amherst deposit is about 1,000 feet wide, and is known to extend North and South for a distance of 7,000 feet. Much of it is stained with iron, and is consequently only suitable for fire-clay, of which a large quantity could be produced. As regards the deposit of white kaolin, a typical analysis shows its contents to be: 47.50 per cent silica, 1.06 per cent. iron oxide, 36.98 per cent. alumina, 0.23 per cent. lime, magnesia (trace only), potash 0.19 per cent., soda 0.18 per cent., loss on ignition 14.10 per cent. = 100.24 per cent. It is of a pure white colour, and its iron content is declared by Dr. M. E. Wilson, of the Canadian Geological Survey, to be negligible.

The size of the deposit is such that it may ultimately provide, not only for the needs of Eastern Canada, but leave a margin for a substantial export trade. This particular clay is said to be competing favourably now with some of the Cornish clays.

With Canada and the U.S.A. concentrating on china clay development, not to mention other countries like Malaya, the time would seem to have come for the home producers of china clay to make a combined effort to emphasize the superiority of their product over the best of all other kaolins. At any rate, they have still got the advantage of unlimited supplies near the sea-board, to enable them to compete in the matter of transport. — *The Chemical Age.*

INDUSTRIAL ITEMS

The Sullivan Machinery Co., Michigan City, Indiana, makers of mine machinery, have opened their new plant in that city and have moved all machinery from the old Chicago plant at 2824 West Lake Street to the new location. The company was organized at Claremont, N. H., in 1869 and 23 years later was merged with the Diamond Prospecting Co., an Illinois corporation. In 1902 the M. C. Bullock Co., Chicago, was purchased and became the Western Manufacturing unit. The principal manufacturing plant is at Claremont, where about 1,500 men are employed. Among the Sullivan company's products are air compressors, undercutting machines, rock drills and prospecting machinery. The management remains unchanged with Frederick K. Copeland, Chicago, president.

The Mine & Smelter Supply Company announce the promotion of Mr. J. P. Bonardi to the position of Sales Manager, of their New York office, succeeding Mr. E. S. Tompkins, who resigned recently. For the past two years Mr. Bonardi has been manager of the Assay and Chemical Department of their Denver house. His good record there accounts for his transfer to New York. Mr. Bonardi is a Chemical and Metallurgical Engineer, a graduate of the University of New Hampshire and of the Colorado State School of Mines. After leaving the latter institution he was connected with the United States Bureau of Mines until joining the Mine & Smelter Supply Company. He has had broad practical experience as well as technical training.

Mining men will be interested to know that the Taylor-Wharton Iron & Steel Company, of High Bridge, New Jersey, makers of the well known "Tisco" manganese steel, are offering new and efficient service in repair parts through their Canadian agents. This concern was founded in 1742 and introduced manganese steel on this continent in 1893. Almost every kind of industry is using their machinery parts to-day. Their experience, both as to method of manufacture and design, is very wide and this experience is now available to Canadian users through Lamoureux-Kelly Limited, 285 Beaver Hall Hill, Montreal.

The Mond Nickel Company have purchased the minority stock previously held by Messrs. Charles T. Hennig and G. P. Bassett, Jr., and are now the sole owners of the American Nickel Corporation, Clearfield, Pennsylvania, manufacturers of pure malleable nickel. Messrs. Hennig and Bassett are no longer affiliated with the Company in any capacity.

HUGE CARVING ON MOUNTAINSIDE

A carved war memorial, 1,100 feet long and 200 feet high, standing ten feet in relief, is described in the current issue of *Compressed Air Magazine*. It is now being cut in the solid granite rock of Stone Mountain in Georgia, U. S. A., as a memorial to the Confederate forces of the Civil War. The face of the mountain at this point is a sheer precipice of almost 1,000 feet, and the carving is being done on the upper part of this face. It is being executed by the sculptor, Gutzon Borglum, with the help of a large staff and pneumatic tools.

SOME REWARDS IN THE OIL INDUSTRY

The oil industry owes its popularity in the financial world to the fact that, although it contains a very large proportion of blanks, it also includes some exceptionally handsome prizes. The knowledge that occasionally a comparatively poor man may go to sleep at night and wake up a millionaire in the morning through a rich oil strike, appeals to the gambling spirit in mankind, which no amount of condemnation is likely to eradicate.

Only recently attention has been focussed on the very large stock dividends declared by some of the leading petroleum companies. These include a recent stock dividend of 400 per cent. by the Standard Oil Company of New Jersey; and the Vacuum Oil and Ohio Oil Companies, both subsidiaries of the Standard, have each paid 300 per cent. stock dividends. The Standard of New York has also declared a 200 per cent. stock dividend, and the California and Kentucky Companies have declared smaller but substantial dividends in stock. Several others are expected to follow these examples.

In 1913 the Standard of Indiana paid a stock dividend of 2,907 per cent.

It is said that these dividends are not due to economies, but that they are merely indications of the stream of wealth that may come from successful oil exploitation.

The following examples of cash dividends are also of an alluring character. The Royal Dutch, which is the nearest rival to the Standard Oil, paid 31 per cent. in 1921 and 26 1-2 per cent. in 1922. The Shell Company, a subsidiary of the Royal Shell, paid 27 1-2 per cent. in 1921 and 22 1-2 per cent. in 1922, and prior to 1921 had paid 35 per cent. for eight successive years. The Mexican Eagle paid 30 per cent. in 1922 on both ordinary and preference shares; and the Lobitos Oilfields, 25 per cent., with a bonus of 15 per cent. free of income tax for the year 1922, besides placing large sums to reserve and carrying forward a large balance.

These results represent those of the most successful companies, and are partly due to good fortune and partly to the foresight displayed by those responsible for the management and operation of the respective enterprises. Incidentally, much of the success has been due to the geological assistance rendered, obtained by a wise expenditure in engaging the best advice available.

The old adage that "nothing succeeds like success" is particularly true of the oil industry. It has often been pointed out that only successful companies can secure the highest skill, adopt the latest improvements in equipment, and endow research.

While shareholders in the above successful companies are to be congratulated on their good fortune, it must not be overlooked that the oil industry in the past has been mainly dependent upon itself for financial support. It is only in recent years that an oil proposition has come to be regarded as something better than a mere gamble.

Formerly oil enterprises requiring capital for extension could not readily obtain this from bankers or financial groups, and, therefore, were obliged to extend their operations out of revenue, which meant that dividends were either curtailed or entirely absorbed by the capital requirements. The large stock dividends of which so much has been made are in many cases the compensation for former sacrifices, in other words deferred dividends, and are not the result of unduly exploiting the petroleum-consuming public, as some have tried to show.

The above-quoted examples represent the rosy aspect of oil winning. The reverse side of the picture shows scores of highly capitalized oil undertakings which have lost all in pioneer exploration in various parts of the world, and the "wild-catters" who have never made good are to be numbered by the thousand.

It has been said of gold mining that it is carried out at a loss on the average—that more money is spent on prospecting and development than is, on the whole, extracted from the ground in the shape of gold. Nevertheless, the Californian goldfields, those of Cripple Creek, Kalgurli, the Witwatersrand, and the more recently discovered Ontario goldfields contain examples of mines which have yielded phenomenally large profits. It is probably much the same in the oil industry, and it is doubtful on which side of the profit and loss account the balance woulld appear, if it were possible to obtain the necessary data. Success advertises itself, but failure is of a more retiring nature, and rarely attracts attention unless it be of extraordinary magnitude or following a previous great success.

The oil industry, like most others, would gain by greater stability, and it is certanly a sign of the times that increased knowledge is tending more and more to eliminate the purely speculative element.

At the same time great prizes are still to be won in oil exploitation, and it is well that the certainty exists to give a zest to enterprise. What better knowledge can do is to reduce the number of failures, and to convince the speculator that there are cases in which nothing short of a miracle can give him a profitable result.—*The Petroleum Times.*

DOMINION FUEL BOARD RECOMMENDS COKING PLANTS FOR DOMESTIC FUEL

The central part of Canada is feeling the need at the present time of an ample supply of domestic fuel of a high quality at a reasonable price. The great strike of last year in the anthracite field was the cause of the acute shortage last winter; but the attention thus drawn to the subject has shown that the deposits of anthracite coal are limited and that the supply is being used up with comparative rapidity.

To assist in the obtaining and distribution of fuel of some kind to tide over this strike period, fuel committees, federal, provincial, and municipal, were created. These committees functioned through the winter of 1922-23 and are still in operation, but they do not touch on the larger problem, that of obtaining a suitable domestic fuel to take the place of anthracite. It was to deal with this problem that the Dominion Fuel Board was established by Hon. Charles Stewart, Minister of Mines. The function of this board is not to find fuel for a few months during an emergency, but to carry on investigations that may indicate to citizens a permanent source of supply. Their task, therefore, is a large one which will take time for completion.

Various lines of investigation are being followed, among others that of the commercial feasibility of producing coke in by-product recovery ovens in our larger cities. The field work in this investigation is practically finished and the information collected is now being prepared for publication. While the details are not yet available, it may be stated that conditions are found to indicate that the erection of plants at several points would be a warranted commercial venture for individual firms or corporations. Investigations are also being carried out by the board in conjunction with the Mines Branch to determine the coking qualities of Nova Scotia and New Brunswick coals and it is hoped these may be available for this purpose and thus relieve the supplies drawn from abroad.—*Mines & Resources.*

THE MINING DISTRICTS

By THE JOURNAL'S CORRESPONDENTS

NORTHERN ONTARIO

Kirkland. — Although it may be merely a coincidence that discoveries of very rich ore are being made in the Tough-Oakes so shortly following the listing of the stock, there is no question but that the recent underground developments have been much more favorable than formerly, and that some exceedingly good ore is being found. It has been decided to continue the main shaft from 800 to 1,100 feet. It is hoped that the company will soon be in a position to resume milling. The new company takes over all the interests of the Tough-Oakes, Burnside and Kirkland Lake Proprietary, and the board consists of four Canadian and three English directors.

Diamond-drilling is being done from the underground workings of the Wright-Hargreaves and Sylvanite mines. The Sylvanite is controlled by interests associated with the Wright-Hargreaves. The rich ore recently opened up on the Tough-Oakes is near the Sylvanite boundary, which adds a considerable prospective value to the latter property.

When the new plant of the Harvey-Kirkland is installed, the shaft will be continued from 200 to 400 feet. Another shaft is to be started on No. 6 vein, several hundred feet distant from the main shaft.

During the month of August the Lake Shore treated 2,066 tons and recovered $43,161, an average of $20.88 a ton.

Porcupine. — It is understood that the Hollinger plans for the development of its power on the Abitibi River have been approved by the Government. With this question settled, activity in construction can be pushed to the utmost limit.

South Lorrain. — During the month of August the Lorrain Operating Company, a subsidiary of the Mining Corporation, produced 137,560 ounces of silver. The latter company is meeting with very good success in the development of its Trout Lake property, where the shaft has now reached a depth of 300 feet. Very encouraging values were found for about 200 feet, at which point the vein dipped out of the shaft. A station is being cut at 300 feet, and lateral work will shortly be started. The Mining Corporation is also operating in the Gillies Limit and has a shaft down about 25 feet. It is probable that this will be continued to a final depth of about 300 feet.

Mr. Hamilton B. Willis has purchased two claims adjoining the Maidens property in South Lorrain. The Maidens is being operated by Mr. Wills and associates, who are identified with the Keeley.

Options Dropped. — The Coniagas company has discontinued work on the properties in Tashota, which it had under option. McKinley-Darragh has also given up its option on the Paul property in Lorrain Township.

Kerr Lake Annual Report. — The annual report of the Kerr Lake shows a total revenue of $345,000 and expenses of $34,000, leaving net profits of $311,000. Dividends to the amount of $300,000 were paid, leaving a surplus for the year of $11,000, and a total profit and loss surplus of $1,239,000. No work was done on the Kerr Lake property in Cobalt during the year, and the company's property in Utah has been practically closed down. Revenue at the present time is being derived from the Rimu Gold Dredging Property in New Zealand, which is controlled by the Kerr Lake. Profits for the year 1923 showed a decrease of approximately $100,000 compared with the previous year, and this is due largely to the falling off in revenue from the silver property in Utah, which was forced to close following the action of the United States Treasury in declining to make further purchases of domestic silver at $1.00 an ounce.

Mikado in Liquidation. — The Mikado Gold Mines in the Lake of the Woods district has gone into voluntary liquidation. It is stated that this plan is necessary in order to clean up various matters and put the affairs of the company on a better basis. It is stated that promotion stock was being sold at lower prices than the company was asking for treasury stock and that the company found it impossible to sell treasury stock in competition with promotion stock and raise enough money to finance operations.

Gold Production in September. — During the month of September nine Ontario gold mines produced approximately $2,000,000 which is probably the greatest output in any one month during the history of gold mining in this Province. Production, in order of importance, came from Hollinger, Dome, McIntyre, Teck-Hughes, Wright-Hargreaves, Lake Shore, Kirkland Lake, Argonaut and Croesus. From the last property a small amount of high-grade gold ore was obtained by sorting. A total of 216,000 tons of ore was milled, with an average recovery of about $9.00 a ton. Over five thousand men were employed in the mines, and an additional large number in other enterprises which contribute directly to the operating of the mines. While the September output probably established a record in gold production for the province, it will not be long before this will be exceeded. The present mines can be expected to maintain their output, while Vipond and Night Hawk Peninsular will soon be producing. If favorable developments continue on the Tough-Oakes, that mill should also be put in commission, while the tonnage being treated at the Argonaut is to be increased.

Matachewan Stocks. — The recent action of the stock of the Matachewan General, which broke practically 50 per cent. almost over night, would seem to call for some explanation from the Standard Stock and Mining Exchange of Toronto, if that organization is to receive the confidence of the mining public. The Mining Exchange would render a service to the public if activities such as those of the Matachewan General were properly investigated. There is a good deal of publicity given to the activities in the Matachewan district, but these activities appear to be confined more to conversation than anything else. It

is unfortunate for the district that the principal properties should be dominated by a firm of mining brokers who seem to be more concerned with the sale and manipulation of stock than with the development of mines.

NORTHWESTERN ONTARIO

The activity shown in the various sections of the Schreiber gold mining area, gives splendid promise of an exceptionally busy field of development and production in the near future. A number of men prominent in the eastern part of Northern Ontario's gold and silver producing areas, have visited this field recently in search of investment for themselves or principals, and have made examinations of properties now under preliminary development, with a view to their purchase.

Prospecting, staking and recording is more active at present in this field than at any time in its history. At Big Duck Lake, Cook's Lake, Harkness claims and Victoria Cape, valuable finds have recently been made that are of an exceptionally interesting and promising character.

Schreiber. — Mr. Hanson, representing John Taylor & Sons, London, has just spent ten days in sampling and investigating the Schreiber Gold Mines, Ltd. property (formerly McKellar-Longworth) and was apparently impressed with his findings. For some time past the work on this property has consisted mainly in stripping and trenching and has resulted in showing up a total of nineteen veins. At present three shifts of miners are employed in putting down a two-compartment shaft on number eleven vein, situated 1,000 feet south of No. 1 tunnel, and are down 22 feet. The vein covers the entire width of the shaft, and carries high values over this width from the collar to its present depth.

A discovery of gold has just been made in a vein 30 inches wide, on the Harkness claims, just east of the Jackson Gold Mines, Ltd., about three miles east of Schreiber, close to the Canadian Pacific Railway. The vein is traceable over two claims, and is being stripped and trenched, showing visible gold wherever opened.

Cook's Lake. — Another find of gold has been made northeast of Cook's Lake, by prospector Matheson, recently of Kirkland Lake, in an 8-foot vein of sulphides and quartz, in schist formation. It is traceable for three-quarters of a mile. This area is being staked rapidly, many claims having been recorded within the past few weeks.

Victoria Cape. — William Longworth has re-discovered a vein varying from eighteen inches to 4 feet, traceable for three-quarters of a mile, located in greatly altered granite on the contact, at Victoria Cape, on the west shore of Jackfish Bay. The vein has been stripped for 800 feet, and has been carefully measured and channel sampled for this distance, carrying values varying from $2.50 to $30, averaging rather better than $10. This vein was originally discovered by the late Donald McKellar, in 1875, and was the first discovery of free gold on the north shore of Lake Superior. At that time Mr. McKellar did some preliminary work and sampling, resulting in returns varying from $2 to $27 per ton, but nothing was ever done with it until Mr. Longworth began operations this summer. Mr. Craig, manager, and Mr. Huston, consulting engineer for the Tonopah Mining Company, arrived on the property on the 6th instant, for the purpose of making an examination, with a view to purchase.

Big Duck Lake. — Horace Strong, representing the Mining Corporation of Canada, has completed an examination of the Beaver (McQuaig) and McKirdy properties at Big Duck Lake. This examination was followed by another sampling and investigation by Mr. Rice, representing the same company, and the latter is now in the East, together with Messrs. Harrison and Hibbert of Cobalt, who hold an option on these claims, negotiating with the Mining Corporation as a result of the above examinations, with a view to their purchase by the latter.

Prospecting and staking in the Big Duck Lake area has been active all summer, and some promising finds are being made.

Jackfish. — Frank Campbell, one of the original prospectors at the Dome Mine, Porcupine, has acquired ownership of the Ursa Major, originally located in 1896 by the Jackes interests of Toronto. The property is situated north of Jackfish station, on the Canadian Pacific Railway, close to the granite contact, in the eastern part of the Schreiber field. Mr. Campbell has had a gang of men employed for some time, engaged in stripping and trenching operations, and has planned to do 10,000 feet of diamond-drilling on this property in the near future.

W. R. Chapman is at Jackfish, looking over several properties in the interest of some people of Belleville, Ontario.

NOVA SCOTIA

Steel Works Committee Doing Well.—The B. E. S Co. General Works Committee is doing splendid work and is creating a very fine spirit among the workmen. One of the first matters discussed was the reinstating in their employment of the men who were laid off during the strike. This in itself shows that the Committee is made of the right metal, and is not afraid to tackle hard problems. It is not always an easy and sometimes a very unwise thing, to restore workmen to their positions before they have come to realize that they have not always acted in the best interests of themselves and the company they served. This action, however, shows that the Committee fully realizes that the spirit of force is after all, not the best and progress can only be made when all working men go forward together, united in a common cause. The wolf at the door of the neighbor, even although he has erred, is far too vivid and personal a feeling to the average workman not to provoke sympathy. The spirit displayed by the Committe is altruistic and is sure to win over their brothers. When the stage has been reached where any corporation stands ready to discuss discipline with their workmen, the relationship existing is better than that of master and servant; it is bordering closely on friendship. The action of the committee will test and try out the qualities of this virtue in the Steel Plant. There can be no greater test of any workman than to discuss the conduct of a brother workman, and to decide what should be done with him. In this case the Committee have to deal with only one side of the matter, and that is restoring

their fellow workmen to their positions. The more difficult question of dealing with workmen discharged for cause is sure to come up at times; but the magnanimous spirit displayed at the very beginning of their work will inspire a confidence and trust in the good sense and judgement of the General Works Committee, which will go far to pave the way for the unchallanged reception of future decisions.

ALBERTA

Regulations Well Received. — Opinion among coal dealers of the Province of Alberta appears to be agreed that the new sales regulations, which were outlined last week, will work out to the advantage of the trade. In some quarters it was thought that too strict an interpretation of the rules might hamper business, but generally the disposition was to wait and see. That one good result would be the elimination of the "snowbird" seemed to be the opinion of most of the regular operators and dealers. This term is applied to traders who bloom in the winter, are not particular as to the class of coal they handle, and fade away with the return of warm weather. The activity of this class of businessman, it is stated, has had a bad effect on the Alberta trade in the Province of Manitoba and it is very desirable that some curb should be placed on such damaging irresponsibility at a time when Alberta is attempting to form permanent trade connections in the Province of Ontario. Chas. W. Leonard, president of the Northern Alberta Coal Operators' Association; W. C. MacKay, of the Fraser-MacKay Collieries Ltd.; and E. B. Johnson, manager of the Marcus Coal Sales, Wholesale shippers, are quoted as being satisfied with the principle of the regulations. They believe that they will, have the effect of protecting the trade and will be generally beneficial if the cost of administration does not prove excessive.

Not Hopeful of Coal Shipments to Ontario. — Mr. E. W. Beatty, President of the C. P. R., when in Western Canada recently made an interesting statement relative to the effort being made to place coal produced in the Province of Alberta in the markets of the Province of Ontario. He said that if the whole of the domestic coal trade of Ontario were secured by Alberta Collieries, it would only increase the operating losses of the railways, if any such rate as $7 a ton for transportation were put into effect. The Canadian Pacific Railway has not been a party to the $7 experimental rate for the reason that it was recognized that the movement could be made only at heavy loss and that the competition of American anthracite and bituminous coal would prevent the permanent use of Alberta coal at eastern points, even though the latter could be used in the case of a coal shortage or any other abnormal situation.

Coal Shipment from Hudson's Hope. — Forty-six tons of semi-anthracite coal from measures situated in the Peace River country in the vicinity of Hudson's Hope have been delivered by scow to the Canadian Pacific Railway to be used as a test of its steaming qualities in the locomotives of the E. D. & B. C. Ry., a subsidiary of the C. P. R. running into the city of Edmonton. If it is a success, of which there is no question in the minds of the members of the coal company, it will mean the establishment of a new coal industry in northeastern British Columbia. Neil Gething, W. Gething, L. Gething, and Leslie Aylard, all of Hudson's Hope, are the promoters of the enterprise.

Order for Coal from Ontario. — The Province of Ontario is securing ten thousand tons of Alberta coal through the Government of the latter Province and the coal operators of the Edmonston district recently received their first order of seven cars. This has been placed through C. W. Leonard, president of the Northern Alberta Coal Operators' Association, and will be filled without delay.

Gas at Wainwright. — Drilling for oil is active in the Edmonton and Wainwright districts of the Province, the two companies so engaged being the Imperial Oil Ltd., and the British Petroleums. Heavy gas recently was struck by the latter company at a depth of 2,080 feet. The Imperial Oil are sinking a number of wells, one of which is reported to have passed through gas and to be down 1,900 feet. Residents of Edmonton are watching keenly these explorations, and the news of outbursts of gas has led to the filing of a number of petroleum claims in the Dominion Land Office.

BRITISH COLUMBIA

Stewart. — Diamond drilling on the property of Indian Mines Ltd., commenced on October 1st and the work proposed is expected to be completed in six weeks. G. D. B. Turner, who has taken an active part in this development, has laid out the exploration program for the next two months and, with its completion, the hope is that plans may be made to place the mine on a producing basis without further delay. It should be shipping in the course of the next six months or within a year at the outside, if hopes are realized. Some 3,200 feet of development work has been done, comprising tunnels, drifts, crosscuts, and raises. The mine is equipped with a 12″ x 10″ Ingersoll-Rand compressor, driven by a 60 h.p. Fairbanks-Morse semi-Diesel oil engine; and a Rix 9″ x 6″ high-speed air compressor, connected to an 18 h.p. gasoline engine. There is a large steel oil tank of 15,000 gallons capacity. The main haulage tunnels and drifts are equipped with all the necessary air lines, ventilating pipe where required, track, mine cars and air drills. The camp buildings include three bunk houses, cook house and dining room with ample accommodation for 30 men; office and assay building, and stables, all situated at mile thirteen, near the present end of the waggon road. The mine is connected with the Stewart dock by good waggon road up the Salmon river valley and thence by three miles of trail to the mine. The Provincial Government have commenced the construction of a high-level bridge across Cascade Creek with a view to extending the road to the mine. Transportation from the contemplated mill to the Stewart dock presents no insuperable problem as there will be no difficulty in the installation of an aerial tramway.

Rossland. — Another shipment of very rich ore is expected to be made shortly from the I. X. L. Mine, Rossland, by the eight leasers who are developing it. They are quoted as saying that they still are working in ore of high value. The two adjoining properties, the O. K. and Gold Drip, also are said to be promising. Eight men are employed on the former and a strike of importance is reported. A trial shipment has been made from the Gold Drip, which is being developed by M. E. Purcell of Rossland, for the owner, Mrs. D. I. McKinnon of Lincoln, Nebraska.

Kaslo. — The operation of the Cork Province Mine, according to a report from W. H. Burgess, secretary of the Company, is proving satisfactory. He states that good mill feed is being obtained containing 15 to 20 per cent. lead and 10 to 12 per cent. zinc. The mill is producing from seven to eight tons of lead concentrate daily. The sixth ton of lead concentrate, since resumption of work, has been shipped and the mill, in addition, is said to be making a zinc concentrate with an estimated gross value of $25 a ton.

The proposed reorganization of the Utica Mines Ltd. is said to be meeting with the approval of shareholders and a meeting is to be held shortly at Kaslo, to further the taking over of the property by H. H. Armstead, of New York. Rev. C. F. Caldwell, known in British Columbia as a mine operator and in the United States as the Zionist leader, is to attend the meeting.

Test Shipments to Ottawa. — The Mines Department, Ottawa, has issued regulations governing the shipment of ores to the Dominion Ore Testing Plant at Ottawa. Shipments weighing at least 50 pounds and not more than a ton may be sent by either freight or express. The Government will pay the railway charges from the point of shipment and cartage charges in Ottawa. In addition the laboratory tests will be carried out without expense to the shipper. Before any large shipment is made, however, a sample must be submitted and a reliable man must affirm that the ore being shipped is from a property showing indications of commercial opportunity. The Government will test the small shipment and, if considered of merit, will request a larger shipment. In the tests all the products become the property of the Government. It is stated that the regulations are designed to give the mining industry of the West the same facilities, with respect to the central ore testing plant, as those given mining operators of the Province of Ontario.

Ymir. — W. T. McDowell, who is interested in the Yankee Girl Mine, Ymir, states that the property was examined recently on behalf of New York interests and that it is likely to be sold.

Trail Ore Receipts. — Ore receipts at the Trail Smelter, Consolidated Mining and Smelting Co. of Canada, for the week September 15 to 21 inclusive, totalled 3,905 tons. Details follow:

Alamo, Alamo	46
Company Mines	2,710
Cork Province, Zwicky	35
Galena Farm, Silverton	93
Hewitt, Silverton	26
Knob Hill, Republic Wn.	39
Lone Pine, Republic Wn.	85
Metallic, Silverton	15
Molley Hughes, New Denver	30
Paradise, Invermere	92
Quilp, Republic Wn.	120
Ruth, Sandon	43
Silversmith, Sandon	288
Standard, Silverton	175
Van Roi, Silverton	50
White Waters, Retallack	68
	3,905

Kimberley. — E. W. Beatty, president of the Canadian Pacific Ry. Co.; D. C. Coleman, vice-president; Sir Augustus Nanton and Sir Herbert Holt, directors; W. R. McInnes, vice-president; and others visited Kimberley in the latter part of September. They inspected the new concentrator of the Consolidated Mining and Smelting Co. and went over other developments in connection with the Big Sullivan Mine operation.

Over 6,000 Miles of Roads and Trails. — It is interesting to note that the British Columbia Government, since the advent of the present Liberal administration, has constructed and maintained mining roads and trails in the Province having a total mileage of 6,348.93, almost enough road and trail in the aggregate to stretch from Victoria to Halifax and back again.

MAP OF WATABEAG AREA

The Ontario Department of Mines has just published the new map of Watabeag Area on the scale of a mile to the inch. This map was published last winter on a much smaller scale in black and white, in order to make it available to prospectors during the season just closing. The sheet covers an area of 18 miles by 24 miles, between the Gowganda and Porcupine areas. The T. & N. O. Railway crosses the northeast corner of the area, in which is Ramore station. Marginal notes give the geology and economic geology in brief. Most of the area is covered with sand and clay. Small amounts of gold have been discovered in a number of places, but so far none of it is of economic importance. In places the geological formation is favourable to the occurrence of gold.

DECENRALIZING OF INDUSTRY

In these days of ever larger and more congested cities, the decentralization of industry is looked to by many as the ideal solution of our industrial problems. These would be solved if our industries were split up into smaller units and were located in small towns or villages. It is thought that people would then lead a more healthful and contented life and would not be shut off from proper recreation facilities.

There is a tendency toward such decentralization latent in the development of hydro-electric power generation. The primary purpose of most such developments is to supply current for public utilities. But there is generally a surplus over the public utility demand which can be used for manufacturing purposes.

Some hold that all of this hydro-electric power will soon be needed and used for public utilities. This is not entirely true. Many of the larger of the new developments will undoubtedly sell most of their power for public service. But there are scores of smaller locations which are distant enough from great centers to enable an industry locating there to compete with the public utilities in purchasing power. When such power sites are not too far from the market and from good transportation, they will undoubtedly form the basis of future industrial towns.

An example of how this works out in even a fairly large waterpower development is furnished by Shawinigan Falls, Que., Canada. At this site the head is 150 ft. and is utilized to develop 195,000 hp. by the Shawinigan Water & Power Co. and 40,000 hp. by the Northern Aluminum Co. About half the former is transmitted to Montreal. The remainder has served as the basis upon which a number of industrial plants have been established, and these plants and the community which has grown up about them give a good idea as to what may be expected if this type of development spreads.

Perhaps the most interesting of the plants is that of the Canadian Electro Products Co. This concern produces acetic acid as a main product, and such other chemicals as paraldehyde, acetic anyhdride, acetaldehyde and butyric acid, which can be made from acetic acid or are by products of the process. Starting with acetylene, which is supplied from a neighboring plant, acetic acid is synthesized by a catalytic process. At the present time the plant is shipping upward of 1,500,000 lb. of this product per month.

The Canada Carbide Co. manufactures calcium carbide and acetylene. This plant has been adapted to the use of the materials which can be obtained in the locality—native limestone and gas-works coke. From these materials are manufactured first quality calcium carbide in all the usual commercial sizes. In addition, acetylene is manufactured in a large generating plant—one of the largest in existence—and supplied to the local branch of the Prest-O-Lite Co. and to the Canadian Electro Products Co.

Another very fine plant located at Shawinigan Falls is that of the Belgo Canadian Pulp & Paper Co. This plant is one of the largest producers of newsprint in existence. This mill is notable for the care with which scientific control is applied to the process and for the alert engineering talent which quickly takes advantage of each new development in paper technology. Perhaps the most interesting feature is the largest newsprint machine in the world, 233 in. wide and—running at 800 ft. per minute—producing 100 tons of newsprint per day.

But interesting as the various manufacturing plants at Shawinigan Falls are, the most interesting thing to the visitor is the community itself. Well-paved streets, good schools, including a technical institute, and several churches indicate, as do the high quality of housing, a prosperous and contented working population. The town has about reached its limit of growth, as the available power for industrial use is all taken up. So the present conditions of plenty of work and plenty of space for all stand a good chance of being preserved and Shawinigan Falls will remain, as it is today, an ideal industrial community.

—Chemical and Metallurgical Engineering

SILVER-LEAD FIND IN AUSTRALIA

In July of this year an important find of silver-lead ore was made about 40 miles northwest of Chillogoe, Queensland, Australia, the site of the State smelter. This is in the peninsula that constitutes the northeastern extremity of Australia, not far south of the equator, where rich silver-lead and copper ores have been mined. The ore is reported to average 65 per cent. in lead and to carry from 18 to 130 ounces of silver per ton of ore. A motor road 45 miles long from Chillagoe to the deposits is under construction by the State. The ore is so rich that the stakers have been able, with very little capital, to develop their property by means of the sale of ore. It is expected that the region will disclose important amounts of this silver-lead ore.

FIRST HYDRO-ELECTRIC PLANT IN SOUTH AFRICA

The first large hydro-electric plant in South Africa is being built by the Rhodesia Broken Hill Company on the Mulungushi River, which is on the Zambesi watershed. The flow of water is inconsiderable, but the head is 1,170 feet, and the Pelton wheels to be installed will develop 10,000 horsepower.

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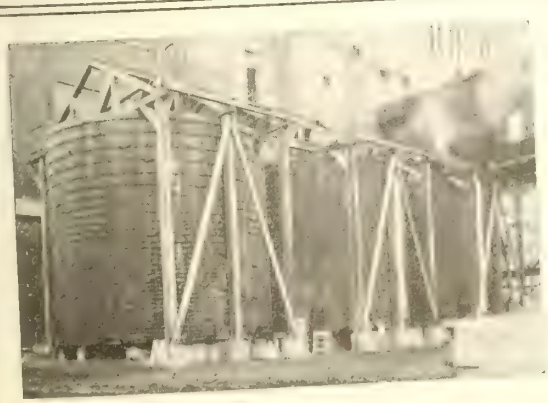
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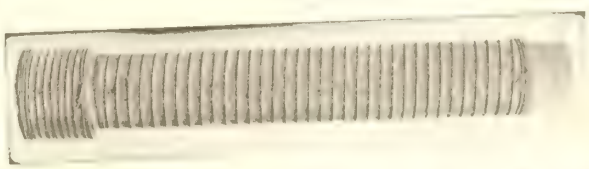
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The chief minerals of the Province of Quebec are Asbestos, Chromite, Copper, Iron, Gold, Molybdenite, Phosphate, Mica, Graphite, Ornamental and Building Stone, Clays, etc.

The Mining Law gives absolute security of Title and is very favourable to the Prospector.

MINER'S CERTIFICATES. First of all, obtain a miner's certificate, from the Department in Quebec or from the nearest agent. The price of this certificate is $10 and is valid until the first of January following. This certificate gives the right to prospect on public lands and on private lands, on which the mineral rights belong to the Crown.

The holder of the certificate may stake mining claims to the extent of 200 acres.

WORKING CONDITIONS. During the first six months following the staking of the claim, work on it must be performed to the extent of at least twenty-five days of eight hours.

SIX MONTHS AFTER STAKING. At the expiration of six months from the date of the staking, the prospector, to retain his rights, must take out a mining license.

MINING LICENSE. The mining license may cover 40 to 200 acres in unsurveyed territory. The price of this license is Fifty Cents an acre per year, and a fee of $10.00 on issue. It is valid for one year and is renewable on the same terms, on producing an affidavit that during the year work has been performed to the extent of at least twenty-five days' labour on each forty acres.

MINING CONCESSION. Notwithstanding the above, a mining concession may be acquired at any time at the rate of $5 an acre for SUPERIOR METALS, and $3 an acre for INFERIOR MINERALS.

The attention of prospectors is especially called to the territory in the North-Western part of the Province of Quebec north of the height of land, where important mineralized belts are known to exist.

PROVINCIAL LABORATORY. Special arrangements have been made with POLYTECHNIC SCHOOL of LAVAL UNIVERSITY, 228 ST. DENIS STREET, Montreal, for the determination, assays and analysis of minerals at very reduced rates for the benefit of miners and prospectors in the Province of Quebec. The well equipped laboratories of this institution and its trained chemists ensure results of undoubted integrity and reliability.

The bureau of Mines at Quebec will give all the information desired in connection with the mines and mineral resources of the Province, on application addressed to

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Aggregate Value of $734,259,619

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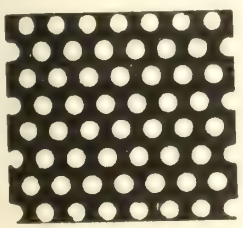

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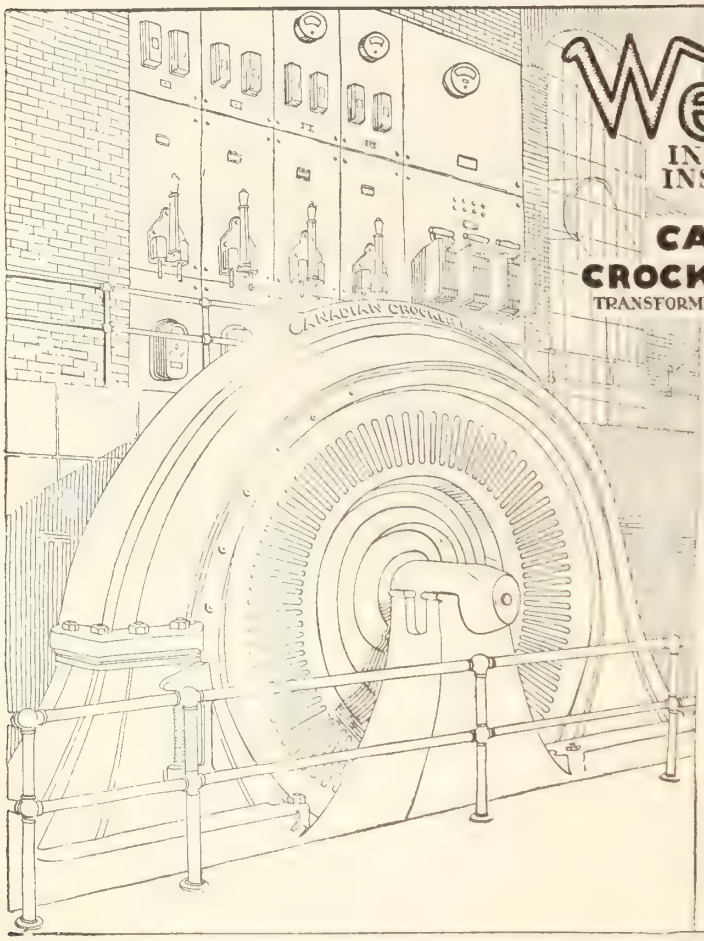

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Talc and Soapstone in Canada, by H. S. Spence.

Titanium, by A. H. A. Robinson.

Summary Report of Investigations made by the Mines Branch during the calendar year ending Dec. 31, 1921.

Phosphate in Canada, by H. S. Spence.

The Preparation, Transportation and Combustion of Powdered Coal, by John Blizard.

Road Materials along the St. Lawrence River, from Quebec Boundary to Cardinal, Ont., by R. H. Picher.

Barium and Strontium in Canada, by H. S. Spence.

The Coal-fields and Coal Industry of Eastern Canada, by F. W. Gray.

Analyses of Canadian Fuels. Part I to V, by E. Stansfield, M. Sc., and J. H. H. Nicolls, M. Sc.

Graphite, by H. S. Spence.

Gas Producer Trials with Alberta Coals, by J. Blizard and E. S. Malloch.

The Mines Branch maintains the following laboratories in which investigations are made with a view to assisting in the developing of the general mining industry of Canada:—

Fuel Testing Laboratory.—Testing value of Canadian fuels for steam raising and production of power gas; analyses, and other chemical and physical examinations of solid, liquid and gaseous fuels are also made.

Ore-Dressing Laboratory.—Testing of Canadian ores and minerals, to ascertain most economical methods of treatment.

Chemical Laboratory — Analyzing and assaying of all mineral substances and their manufactured products. Copies of schedules of fees, which are slightly in excess of those charged by private practitioners, may be had on application.

Ceramic Laboratory.—Equipment is such that complete physical tests on clays and shales of the Dominion can be made, to determine their value from an economic standpoint.

Structural Materials Laboratory.—Experimental work on sands, cements and limes is also undertaken.

Applications for reports and particulars relative to having investigations made in the several laboratories should be addressed to The Director, Mines Branch, Department of Mines, Ottawa.

GEOLOGICAL SURVEY

Recent Publications

Memoir 108. The Mackenzie River Basin, by Charles Camsell and Wyatt Malcolm.

Memoir 127. Beauceville map-area, Quebec, by B. R. MacKay.

Memoir 128. Winnipegosis and Upper Whitemouth River areas, Manitoba, Pleistocene and Recent deposits, by W. A. Johnston.

Memoir 129. Geology of the Moncton map area, by W. Wright.

Memoir 130. Geology and mineral deposits of the Bridge River map-area, British Columbia, by W. S. McCann.

Memoir 131. Kenogami, Round and Larder Lake areas.

Memoir 132. Geology and ore deposits of Salmon River district, British Columbia, by S. J. Schofield and G. Hanson.

Memoir 133. The southern part of the Sydney coal field, Nova Scotia, by A. O. Hayes and W. A. Bell.

Map 68A. Moncton, New Brunswick. Geology.

Map 155A. Portions of the districts of Algoma, Sudbury and Timiskaming, Ontario. Geology.

Map 1585. Mackenzie River basin, 1922 edition. Geology.

Map 1751. Wainwright, Alberta. Topography.

Map 1752. Monitor, Alberta and Saskatchewan. Topography.

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Map 1830. Vermilion; townships 47 to 55, ranges 5 to 10, west of the fourth meridian. Topography.

Map 1831. Vegreville; townships 47 to 55, ranges 11 to 20 west of the 4th meridian, Alberta. Topography.

Map 1860. Keno Hill area, Mayo district, Yukon. Geology.

Map 1948. Wanapitei Lake area, Ont. Geology.

Map 1964. Brockville-Mallorytown area, Leeds county, Ontario. Geology.

Map 1965. Fraser River delta, British Columbia. Geology.

Map 1972. Michipicoten area, Ontario. Geology.

Map 1977. Mackenzie river between Norman and Bear river, district of Mackenzie. Geology.

Applicants for publications not listed above should mention the precise area concerning which information is desired.

Summary Report — The annual Summary Report of the Geological Survey is now printed in parts. Applicants should, therefore, state what particular geologist's report is required, or what subject they are interested in.

The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon.

Communications should be addressed to The Director, Geological Survey, Ottawa.

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Preliminary returns show the output of the mines and metallurgical works of the Province for the year 1922 to be worth $62,202,169, of which the metallic production was $38,190,711.

The following figures show the growth of Ontario's mineral industry by five-year periods since 1891 when a Bureau of Mines was first established.

Year.	Value.	Year.	Value.
1891	$4,705,672	1911	$41,976,797
1896	5,235,003	1916	65,303,822
1901	11,831,086	1918 (Maximum war output)	80,308,972
1906	22,388,383	1921	48,128,387

Dividends and bonuses paid to the end of 1922 amounted to $28,096,699 for gold mining companies, and $86,238,185 for silver mining companies or a total of $114,334,884.

Mining Regulations

A miner's license costs $5.00 per annum, and entitles the holder to stake out in any or every mining division three claims of 40 acres each. After performing 200 days' assessment work on a claim, patent may be obtained from the Crown on payment of $2.50 or $3.00 per acre, depending on location in unsurveyed or surveyed territory.

Assay Office

The Provincial Assays Office at No. 5 Queen's Park, Toronto, is maintained by the Department of Mines for the free identification of minerals, free assays under the provisions of the Mining Act of Ontario, and also for general assay work as per the Schedule of Charges which may be obtained on application.

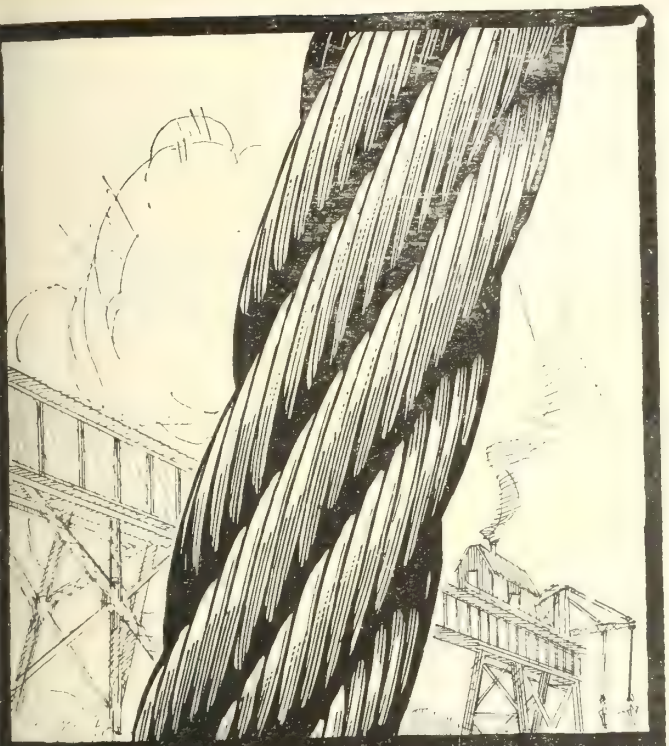
Temiskaming Testing Laboratories

The Department maintains, at Cobalt, an ore sampling and testing laboratory which is now prepared to receive parcels of gold ore from 100 pounds upward, and after sampling and assaying the same to pay to the shipper the value thereof, less treatment charges. The purpose is to afford a market for ores extracted by prospectors and others in developing their mining claims, enabling them to obtain funds which they can use for further work and to report on the most satisfactory method of treatment. Fuller information may be obtained on application to the Manager, Temiskaming Testing Laboratories, Cobalt, Ontario.

Publications

For list of publications, illustrated reports, geological maps and mining laws, apply to

Thos. W. Gibson,
Deputy Minister of Mines.
TORONTO, CANADA



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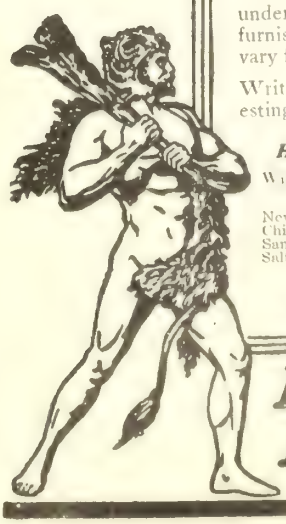

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VOL. XLIV. Gardenvale, P. Q. October 26th., 1923 No. 43

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:-: EDITORIAL :-:

CERAMIC INDUSTRY GROWING RAPIDLY

During the last few years there has been a healthy growth in Canada's ceramic industry, which promises even better things for the future. The heavy materials, such as brick, tile of various kinds, sewer pipes, fire-brick, terra-cotta, fire-proofing, etc., have been made for years on a scale commensurate with our needs. But it is only comparatively recently that the finer grades of ceramic products have been made on any adequate scale.

Though development in the west is full of promise, our chief centre of ceramic manufacture still remains in the east. In Ontario and Quebec, however, practically all the raw materials, including fuel, are imported, so that a successful ceramic industry in these provinces at present depends almost entirely upon the protection of tariffs and the advantage of a near-by market. In the west, on the other hand, the chief ingredient, clay of various grades, and the best of fuel, natural gas, are available in abundance, and these advantages promise to provide the basis for a thriving and extensive industry.

One can best gauge the progress of ceramic manufacture in this country by considering a few representative examples. Canada is one of the world's leaders in the use of electricity. Now she possesses porcelain factories that are turning out 220,000-volt insulators, equal to the best. Two firms are making insulators of this and other kinds, one in Hamilton and one near Niagara Falls. One of these firms recently purchased a porcelain factory in Limoges, France, in order to provide their European customers more economically with high-voltage insulators. In addition there are factories producing low-tension insulators and other porcelain ware.

Canadian-made vitrified sanitary ware has now a firm hold on the home market, as have enamelled iron ware of the heavier varieties such as lavatories and bath-tubs, and of the lighter kinds, such as kitchen ware. There are numerous manufacturers of these products in Ontario and Quebec.

The common domestic and electrical glass ware in use in this country is now made mostly within our borders. For it, too, the chief raw material, sand, is mostly imported, but the chemicals, lime and soda, are Canadian-made.

The vitrified floor tiles now being used in this country are got mainly from a factory in Kingston, Ontario, which is capable of supplying the whole Canadian trade. The chief ingredient of these tiles is feldspar, which is obtained locally and ground at the factory. There is insufficient tariff protection to allow the manufacture in Canada of the corresponding glazed wall tiles.

The pottery industry is the branch that has made the most notable advance during the last year or two, with promise of a rapid and large expansion. Recently small potteries have been established at Banff, Alberta and at St. Andrews, New Brunswick, producing very creditable art pottery, such as vases, trays and jugs and catering to the tourist trade. A pottery plant is now being completed at Oshawa, Ontario, where it is proposed to produce tableware on a fairly large scale. It is understood that other companies are formulating similar plans. For years there have been potteries at St. John, New Brunswick; Iberville, Quebec; Hamilton, Ontario; and Medicine Hat, Alberta, making stoneware and other heavy domestic pottery such as teapots, mixing bowls and hospital ware. A feature of the Medicine Hat plant is an abundant supply of natural gas which warrants the shipment westward, away from the chief market, of the pottery clay and ball clay of southern Saskatchewan. Their very low fuel cost permits them to compete successfully in the Ontario and Quebec markets.

At present Canadian specialists in ceramics, and particularly in pottery manufacture, are few and far between. This condition will be rectified rapidly when the ceramic school of the University of Saskatchewan commences to turn out graduates. Meantime the Ceramics Division of the Mines Branch, Department of Mines, Ottawa, which is in charge of Mr. Howells Fréchette, is available for free consultation by those interested. This department of the Mines Branch has done yeoman service during recent years in helping to put Canada's ceramic industry on its feet.

THE CANADIAN MINERAL EXHIBIT

The exhibit of minerals will be an outstanding feature of Canada's display at the British Empire Exhibition next year. Already a large part of it is in Ottawa, ready for shipment to England, and every day additional lots are received from the Dominion's various mining districts.

Ontario, as the premier mining province, will no doubt display her riches to good advantage to the millions of people who will visit the Exhibition. Mr.

Thos. W. Gibson, Deputy Minister of Mines in Toronto, is taking a particularly active interest in sending on choice specimens and in stimulating mine managers and others to do likewise. Some of the ores of the province are well adapted for display, and full advantage is being taken of this fact. The wonderful specimen of silver ore from the 54-inch vein section of the Keeley now reposing in the parliament buildings is too large and unwieldy to take across the ocean and back again. Instead, South Lorrain is well represented by a particularly beautiful 1,200-pound specimen from the Frontier mine which carries 8,000 ounces of silver to the ton. This will compose the central figure in a comprehensive exhibit from the camp. Cobalt will, of course, be adequately represented, a feature being a series of specimens from the 1,600-foot level of the Beaver mine to illustrate conditions at the lower silver-bearing contact of the diabase sill. Porcupine, with its "big three" mines and shoots of spectacular ore; Kirkland with its tellurides; Night Hawk, Larder —all will add their quota to the best gold exhibit Ontario has yet produced. An exceptionally fine lot of nickel ores, smelter products and finished materials has been provided by the three large nickel companies. Non-metallics such as talc, feldspar, graphite and mica will round out the display.

British Columbia's mineral industry is notable for its variety and for the large number of its mines, large and small. Dr. J. Fleet Robertson, the Provincial Mineralogist, is in a particularly favourable position to make use of this in gathering the exhibit for his province, which is now in Ottawa entire. He has had active deputies in the resident mining engineers in charge of the various mineral districts. In addition to the ores of gold, silver, lead, zinc and copper that account for most of British Columbia's output, there are numbers of the less well known minerals such as magnesium sulphate, fluorspar and ochre, which are adding their modest quota to the province's annual production. This will be by far the best exhibit British Columbia has had, even though some former exhibits are hard to beat.

The first specimens of silver-lead ore from the Mayo field in the Yukon were sent to the San Francisco exhibition. The new Mayo will show next year, by grace of the finds on Keno Hill, specimens that should stimulate a general interest in our new sub-Arctic mining field.

Manitoba is the latest of the provinces to give definite promise of producing metallic wealth. In spite of comparative inaccessibility and the reaction that inevitably follows over-speculation, its development is proceeding steadily under the wing of the Commissioner, Mr. J. A. Campbell of The Pas, who has supplied a representative collection of the gold, copper, zinc and other minerals already located in the mineral belt.

Quebec's mineral stand-bys for many years have been asbestos and copper pyrites. To these will be added this year zinc-lead ore from Gaspé, which has provided some unusually fine specimens, and gold ores from the new finds in the north that are making such a stir at present. These latter will have the added interest of uncertainty; it is not known yet whether or not the deposits will disclose "another Hollinger", or several of them. Quebec also has working deposits of feldspar, mica and other non-metallics whose products will lend variety to the exhibit.

The most important of all our minerals, and the least impressive to look at, is coal. Canadian coals will be shown on a comprehensive scale, from the vast fields of Alberta, the smaller basins in the western mountains, and the strategically situated maritime fields of Vancouver Island and Nova Scotia.

A special feature will be a collection of the raw materials and products of the ceramic industries. This will represent the Dominion from coast to coast in one exhibit. Seldom do we realize the importance of clay products in everyday life. We have now a surprisingly complete line of ceramic manufactories in Canada from the bricks that compose the walls of our houses to the electric bulbs that light their interiors.

We wish to make it known to the British people that Canada has already an important and diversified mineral industry, whose future promises still better things. There are few practical measures that could aid more in accomplishing this end than the mineral display to be seen next summer in the central Canadian pavilion at Wembley.

THE PROPOSED ASBESTOS MERGER

It has been admitted officially that the asbestos industry of Quebec has suffered severely during the last year or two by reason of unnecessary and unreasonable cutting of prices. This is bad business — bad for the asbestos producers as a whole, whose profits are reduced, bad for the Province of Quebec, whose taxable income is lessened, and bad for the Dominion, which thus disposing of a natural resource at less than its worth. Any reasonable and sound measure of cooperation among the asbestos companies that will eliminate undue competition for markets will benefit themselves the Province and the Dominion.

In spite of keen competition from other fields, particularly Rhodesia, the Quebec asbestos district still holds the larger part of the world's markets. The quality of its product is almost, if not quite, unique. It is close to the largest market, the eastern United States. It has vast reserves of ore of a grade equal to that now being worked. It can, if it is allowed, hold the field against all comers. Excessive competition among Canadian producers will not aid the industry; it will result merely in robbing the mines of their best grade of ore and presenting it at a reduced

price to our neighbors in the United States and to other buyers overseas.

It is with great satisfaction, therefore, that we note the reports now current that negotiations for a merger of all the asbestos producers show some signs of success. The *Financial Times* reports that Asbestos Corporation has made a definite offer to the other companies to acquire their holdings, and that this offer is being considered seriously. We hope that the negotiations will lead to a merger. There is plenty of competition from without to induce energetic and efficient management. What is most needed at present is unity within the Quebec asbestos industry, and the strength that union brings.

A united Canadian asbestos industry can do a great deal more than drive a shrewd bargain with buyers; it can increase its profits in other ways. The principal mines lie in a congested area at Thetford Mines. Some of the properties have inadequate surface rights, while their neighbors have land to spare. In other cases party walls are a nuisance. Mining and hoisting equipment is duplicated in adjoining pits, where a single set would serve the combined pits. There are numerous comparatively small crushing plants and mills, where a smaller number on a larger scale would treat the ore at lesser cost. Each of the present companies must maintain a complete office and selling staff. Last, but most important in our eyes, it is only the present state of disunion among the asbestos companies that has prevented a thorough-going, fundamental research into asbestos production — a research that must be undertaken and carried through before Canada will reap the full benefit of these wonderful deposits of asbestos ore.

If there were a market of appreciable dimensions in Canada for raw asbestos, one could hardly urge a merger with the object of raising its price; but there is not. The principal Canadian factories for working up the raw material are connected with the mining companies. There can be, therefore, no reason but human perversity that will prevent the proposed combination of interests. We trust the negotiations now in progress will result in a united Canadian asbestos industry.

TECHNICALLY DIRECTED PROSPECTING

The directing of prospecting by trained technical men is the theme of four American teachers and engineers whom we quote in these pages today. Fortunately for the progress of our mining industry, it is a theme that is becoming rapidly a favourite topic for discussion among those whose interests lie essentially on the outskirts of the industry, where pioneering is the order of the day. While some worthy mining men bemoan the passing of the old-time prospector, with his rule-of- thumb methods, his perseverance and his temerity (mixed, we may add, with equally important objectionable qualities), others with a clearer vision see the new régime that is coming. The search that was left formerly to the impulse of the natural born prospector will, in the future — the near future, we venture to predict — be organized and directed in much the same orderly and rational fashion that now is the vogue in mining operations. The trained technician will take hold of the search for ore much as he took hold of the mining of it a quarter of a century ago.

We do not mean, of course, that every prospector should be a mining engineer or geologist, any more than that the whole force of a mine should be college graduates. But, as it requires a well-trained man with practical experience to get the most out of a mine, so it is necessary that the efforts of the average prospector should be directed in order that they may be expended to the best advantage.

At present there are only a handful of men in Canada competent to direct systematic prospecting. Most of these are geologists, and a few are mining men. The two principal requirements are that they have at their command the requisite scientific knowledge, and that they have a thorough and practical knowledge of how to prospect. Few scientifically trained men have the latter; their scholastic training seems to dull the natural instinct that provides at once the prospector's impulse and his faculty for finding mines. The formal studies guide the feet of the young man on the road to the mine and mill rather than along the trail that leads at last—perhaps only at long last—to the hidden treasures of the woods and the mountains.

This question is worth the serious consideration of mining engineers, mining investors, and those responsible for the teaching in our mining schools. We make no apology for bringing the matter once more to the attention of the *Journal's* readers.

SURPLUS EARNINGS OF MINERAL INDUSTRY

The mineral statistics that we look upon often as dry-as-dust and not of much account in the real affairs of the mining world are actually veritable storehouses of information and often they contain, hidden away in their columns of figures, ideas that are of much general interest. Recently we dipped into the report of the Dominion Bureau of Statistics for 1921, the last year at present available, and found a picture in tabloid that may interest others. In that year of depression the mines, mills and smelters employed 56,976 persons, who earned $79,161,640 and produced materials to the value of $170,714,084. The invested capital was $559,514,151 and fuel and other expenses were $61,780,862. Allow 12 per cent. interest on the investment and there remains over $40,000,000, which might be considered as available for reinvestment in the mineral industry. We should like to see a more expert exposition than our own of this point.

The Uses of Concrete in and about a Coal Mine

II. — Underground Structures

By LUKE LINDOE*

Coal mine operators have not been slow to avail themselves of the admirable qualities of concrete for above ground structures. With an eye always open for a chance to reduce overhead expense from maintainance, repair and insurance charges, they were not for behind other industries in adopting this substantial building material. Intelligently designed and constructed with thought for future requirments and additions, concrete buildings pave the way for the continuity of operation and low final cost so necessary to efficient mining operation.

It is below ground, however, that we do not see it used to the extent that its merit warrants. This in part is due to the time honoured custom of using timber for all classes of work, to the class of labour usually obtainable below ground, and also to the fact that opportunities are missed to use concrete in work of a permanent nature. Time and again one will see timber used in mine structures or supports that has to be renewed again and again. This work, quickly and cheaply done at first, must be repeatedly renewed, until at last, through delays and increasing labour charges, it costs twice or thrice what a permanent piece of work would have done in the first place. There are many places in the mine where, owing to the temporary nature of the requirements, the use of concrete is, of course, out of the question. These can usually be detected at once and the thought of concrete dismissed. If, however, all cases were carefully analyzed we would see more concrete used than at present.

Mix Concrete at the Surface, if Possible

The placing of concrete is attended with more difficulty below than above ground, owing to lack of space and light, and other difficult working conditions. These disadvantages are partly offset by the simple form an underground structure usually takes, pleasing appearance not being of much account below ground. Strength and permanency are the features to be aimed at, and to obtain these, certain requirements are necessary. It would, for instance, be unwise to build a concrete dam or stopping in a mine where the roof and floor were very strong and the coal soft and friable, or if weight were bearing on the coal, and settlement taking place. The very characteristics that make it so valuable under the proper conditions would cause its failure here, since, being rigid, it would be crushed under the enormous weight. It will be seen, therefore, that the requirements below ground are quite different from those above ground, and that the natural conditions must regulate the type of structure installed . When once this is done , the satisfaction gained from not having to make renewals will amply repay the additional first cost of concrete.

In these days of permanent highway building, concrete has become a popular material for their construction, and in an attempt to cheapen the cost of laying, engineers and contractors have evolved the central mixing plant. There would rarely be a job of such magnitude in even the largest mines as to warrant the erection of a central mixing plant; but the principles involved can be used to accomplish an entirely different end. It has been found that about one and one-half hours can elapse between the times of mixing and of placing the concrete without any undesirable effects showing in the finished work. This opens up the possibility of using a mixer on the surface, loading the mix into a car and sending this into the mine to be placed in the forms. If the work is being done on idle days or week-ends, there will be no difficulty in getting the concrete on the job in much less time than was mentioned above. This permits an important part of the work, the mixing, to be done where the working conditions are good and the various materials are accessible. In mixing below under the usual conditions of unskilled labour and inadequate supervision, the cleanliness and thoroughness so essential to good mixing are not so likely to be observed.

As was mentioned above, in the design of concrete structures for use below ground, simplicity and strength should be the key-notes. Rarely are the physical conditions stable as on the surface, where good bearing for foundations is the only real factor to be taken into consideration outside of the superstructure itself. Both roof and floor may show slight movement, and in almost all cases gradual subsidence of the roof will occur necessitating provision being made in design to take care of this. The walls of any building such as a pump house or repair shop, will need to be thick enough to carry the weight that may be induced by opening up the additional ground for the site, even though this settlement is not occurring at the time of construction.

The cases deemed worthy of consideration under the caption of this article are any structures of a permanent nature required to house machinery, such as hoist or pump houses and repairs shops, dams, air stoppings, landings at the top and bottom of slopes, stables for horses and linings for entries or tunnels driven through strata that disintrgrate in time through the action of the mine air on their surfaces. As machinery foundations are almost always built of concrete, whether above or below ground, they will not be specially mentioned, nor will shaft linings and bottoms be discussed, as they usually have to have individual treatment and are deserving of a special article.

Pump Houses

Coal mining laws usually require that any building housing electrical machinrey shall be of fireproof construction and well ventilated. As modern pumping is usually done by electrical power, this at once places the materials to be used in a restricted category. Even if some other power, such as steam or compressed air, is used, the likelihood is that, since for economical considerations or in view of proposed future changes electrical drive might be adopted later, it might be considered necessary to design the building with a view to such a change.

The site for a pump house should be chosen so that it will not be affected by the mining operations, either present or future. Indeed, this applies to the whole pumping arrangement, as any great movement or crushing of the strata might not only be detrimental to the pump house, but might affect seriously the sump also. The latter would not only endanger the lives of work-

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ien, but would be costly, and would affect seriously he mining operations. A pillar of adequate size must e left round both to insure that any squeeze occurring n the working sections may be checked before affecting ither pump house or sump.

Fig. 1 gives the details of a concrete pump house designed to fill the main requirements. Footings and oundations have a bearing on the solid floor rock, which has been blasted level to receive them. The walls are of sufficient thickness to support the added area opened up. In this case, as there is a considerable space between the roof of the building and the roof of the seam, timber sets resting over the walls of the pump house will be used to support the rock above, these sets being lagged between to take care of any small rock that may work loose. Where the space is limited this sup-

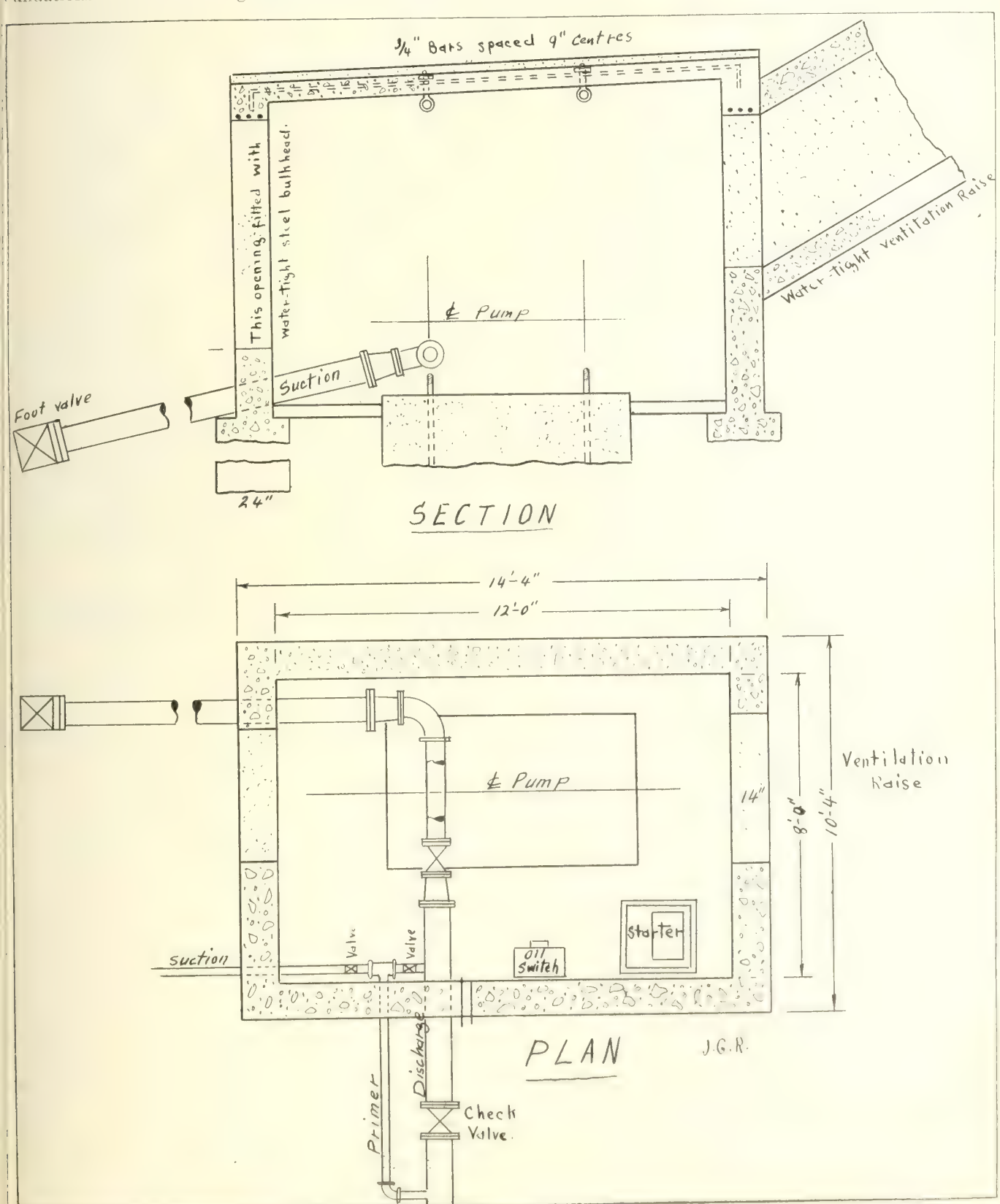


Fig. 1.—Underground Pump House.

Note provision for operating pump when water has risen to a level above the pump house by closing water tight bulkhead.

port could take the form of small timber cogs resting over the walls as above. A roof re-inforced with ¾" round bars gives protection to the machinery below. Over the centre line of the pump and motor the roof is increased in thickness to a width of 24" and provided with further re-inforcement, to form a beam into which eye-bolts are placed to afford an easy means of lifting heavy parts by block and tackle. A door opening opposite the centre line of the pump and tracks to this opening facilitate the removal of parts or the whole of the unit to the surface for repairs, etc. Another 4 feet by 4 feet opening in the opposite wall, connected to a ventilation raise, assures an adequate supply of air passing over the motor. In order to open no more ground than is necessary the building is made just large enough to give working room round the parts for repairs, oiling and starting, and the convenient placing of the starting and switching equipment. Electric lighting is advisable where possible and the lights should be placed so as to give proper illumination on such parts as valves, switches, gauges and starter.

Devices to Avoid Inundation of Pumps

While discussing this subject it might be interesting to comment of the precautions taken by wide-awake operators to so arrange their pumping installations that the pumps will not be immediately inundated in case of sudden abnormal inrushes of water. These might come from various sources; a cloudburst might cause creeks the flood over their banks and the rising water to enter the surface openings. Settlement of the strata over worked out areas may develop cracks and fissures to the surface, through which surface water may percolate. Old workings containing water may be tapped, increasing the daily amount to be pumped, and that must be provided for. The causes might be many, but whatever they are, the effects are to be avoided as being not only dangerous to human life, but costly to operation. The pump, once flooded, is out of action, and other equipment has to be installed to unwater that section, which takes time and usually results in the water getting so far ahead as to stop mining operations in that district for some time. Even when the water is once more down to normal level, a considerable time must elapse before the motor can be taken to the surface and dried out.

In looking for a solution of this difficulty, various means have been adopted, and most of them with good results. A method used at one mine is to build one or more dams, as required, on the entries leading to the pump, through which the water passes, to cause the water to rise in the workings above the pump. Depending on the arrangement of dams, which will differ at various mines, the water may be raised to some considerable height before affecting the pump. The mine referred to was able to make provision for a height of 300 feet before the water could flow down to the pump house. The suction pipe of the pump is carried through that dam which is placed at the same level as the pump house, and any height of water behind the dam assists the working of the pump by the increased pressure obtained.

An unused slope can also be utilized for the same purpose by placing a dam at the bottom of it, and carrying the pipes through as mentioned above. An exceptional case occurs at one mine across the border where large quantities of water are to be pumped daily. The owners sank a shaft, tapping the strata near the lower workings, which were to be used as a sump for storage of large quantities of water. The bottom of the shaft and these workings were connected by a small drift, and the pipes placed in this, the drift being afterwards dammed. Two large capacity pumps were installed in the bottom of the shaft, where they could be operated without being affected by the water in the mine.

Underground Hoist Houses and Repair Shops

The general requirements for hoist houses and repair shops are the same as for pump houses except as to size and interior arrangement. Hoist houses will require more working room around the machinery than the pump house, which in turn will require larger roof spans. This can usually be taken care of by placing a sufficient number of square or rectangular columns in proper relation to the roof area, and in convenient positions with regard to the machinery. In the case of repair shops for locomotives and coal-cutting machines etc., these columns can be so placed so as to come between the pits, or the interior could be divided into some convenient arrangement by solid partition walls.

Dams

Sometimes it becomes necessary to place a dam in the entry or entries of a mine to prevent the inflow of water from some very wet portion of the strata, or as mentioned previously, from abnormal sources. They are sometimes used in connection with pumping installations, for storing water during non-pumping periods. In some European countries an ingenious arrangement of tapered wooden blocks is built up to form a dam, the large ends being toward the pressure side, the whole tending to bind and become compact as the pressure against the surface is applied. Whether it is that the art of building these is not known on this side or that they are adaptable only to narrow seams, the fact remains that a large percentage of dams used on this side of the water are built of concrete, and some of brick.

Of particular importance in the building of an underground dam, in the selection of a suitable site. This should be in a place where the adjacent strata are free from crevices, faults, etc., through which the water might be forced when the pressure becomes great. These fissures would in a short time be worn large enough to pass considerable water behind the dam, and the stability of the dam would become endangered by the action of the water on the coal into which the dam is hitched. The walls, roof and floor at the site should be firm and solid, so that the dam may not be pushed bodily from its bearing by the pressure of abnormal storage.

The accompanying drawing shows a concrete dam that was built to withstand a pressure of 200 pounds per square inch, and probably typifies the maximum requirements for underground dams. As it was thought that the concrete might not be water-tight under such a high pressure, a thickness of waterproofed mixture was carried up on the pressure side as the main wall was being placed. A row of drain pipes fitted with valves were placed in the forms near the bottom, to pass the water during construction, these being closed at the completion of the work. Another row of 1" pipes placed vertically at regular intervals permits of the height of water being tested by opening the various valves with which they are fitted. A manway was provided consisting of a large diameter pipe to which a water-tight steel door was attached, allowing of passage through for inspection and repairs. When the concrete approached the roof of the seam where it was impossible to pour it in the usual way, grout was forced by compressed air through 2" pipes, which successfully made a water-tight joint. The same end could be accomplished by placing

iis portion of the wall with the cement gun now on ie market, which blows the mixture into place directly. f it were possible to use one of the latter machines, it ould be advisable to utilize it further by covering the djacent roof, floor and sides with a ¾″ coating for ay 30 feet at each side of the dam site.

Stoppings

While it would impracticable to build concrete stoppings throughout the mine, there are points in every entilating system of a mine, as on the main airway, especially near the fan, where, owing to high water gauge ressure and the necessity for a permanent stopping, heir use is justified. While more expensive to build han wood, they prove more economical in the end on ecount of their tightness and the consequent saving of ir.

The pressure exerted by the air on a stopping is slight, nd it should be placed where the strata are firm, so hat it does not have to sustain any undue weight. It ollows, then, that its construction can be fairly light, nd therefore, in comparision with other concrete structures, it is of low cost. Except in unusual conditions t need not be provided with a door, assuming, as mentioned above, that it is placed so as to form part of the ain airway, where it can be inspected as the airway s being travelled.

A typical installation consists of a 12″ concrete wall, he bottom resting on the floor rock and the sides being itched some distance into the coal at the sides. All he work of preparing the cuts or bearings in the coal or the walls should be done by hand so as not to disturb he strata, as would be done if blasting were resorted o. The top 8″ of wall may consist of a squared cedar timber, neatly grouted in place with cement mortar to form a tight joint with the roof, and also to allow of some settlement.

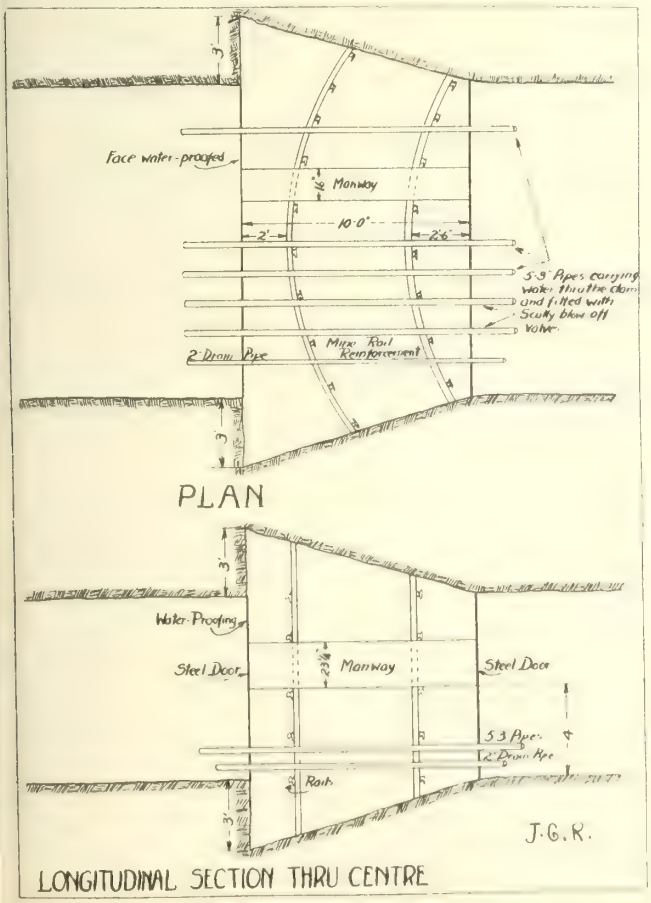


Fig. 2.—Concrete Mine Dam.

If it is necessary to provide means to pass through, an opening 28″ x 28″ can be formed in the wall forms, and a 2″ x 6″ frame set in, to which a 24″ square door of 3-ply T & G lumber with tar paper between is hung on the pressure side.

Slope Bottoms, Arches, Etc.

One of the most useful applications of concrete construction below ground is to arches at slope bottoms. Often the strata through which the landing is driven are not strong enough to support themselves, but have to be kept timbered. Again, what might have been good material when first exposed, becomes loose and friable in time, owing to the action of mine air constantly playing upon it. This causes the surface to disintegrate and it falls, endangering not only the bottom men working under it, but in time greatly increasing the original section and thereby making it more difficult to support. From the standpoint of cost, the chief drawback is the delay caused in cleaning up the damage done by wrecks resulting from runaway trips on the slope. If the slope is 30 degrees or more, a "dog" trailing behind the trip to derail it, in case of a break in rope or coupling, merely overturns the ears, and they proceed merrily on down the slope to the bottom, knocking out sets or anything in their path. The scene at the bottom is usually something to marvel at, timbers, rock and broken cars lying in an inextricable mass. Even with the best of organization, the best part of a shift is gone before the debris is cleared away, and enough timber set to make the place safe to work in again.

Where the bottom is protected by a concrete arch the labour entailed in clearing away is much less. While the cars will be broken as badly as under other circumstances, they are all that is to be handled, and an hour or two at the most is all that will be required to get running again. In mines where these runaways occur at all, they do so rather frequently, and if the loss in output and repair work were kept accounted, it would make startling reading.

Protection of Slopes and Entries by Thin Coatings of Concrete

About two years ago a new method of applying concrete in thin coats were introduced. A mixture of cement, sand, very fine gravel and water is applied under air pressure by a machine known as the "cement gun," the mixture itself being called Gunite.

Like all new things, it was slow in getting a footing, but to-day it is being applied with success to a great diversity of uses. It is known to be an excellent surface protection for all manner of works, from dams to irrigation ditches, and from structural steel to the outer surfaces of dwellings and other buildings.

The coal mining industry has found it an excellent means of preventing the deterioration of roof and sides of slopes, entries, etc., by excluding mine air with its slacking effect. It also renders the surface fireproof, an important improvement in roadways carrying trolley wires or high tension conductors. These have been the source of many fires, and in some cases of explosions. On roadways where the weight is not excessive it can be used to give support to the roof, making a large saving by eliminating timber. Its use tends to make better

travelling and haulage roads for the same cause, as rock falling onto the rails is a frequent cause of derailments.

It is not to be expected that the use of gunite would be an economical means of supporting roadways in all mines, or indeed in all entries in any one mine; but where the cost of timber is high, and the strata driven through are practically self-supporting when first opened up, it might easily be justified. Certainly in all mines there are places where its use would be advisable, as in shaft and slope bottoms where timber is used more as a precaution than of necessity. Small falls that occur from time to time, causing the derailment of cars, or danger to men, would thus be avoided. The additional room obtained by the elimination of timber sets is another factor of importance in such places. The operator of any mine having the facilities to do so would be well advised to try the process on one or more of his development projects that come under the above category. If, as in some of the mines where it has been used, he found that after six years it was as good as when put in, he might find its use justifiable.

This article has mentioned only a few of the uses to which concrete can be put underground with profit and satisfaction to the operator. Others will suggest themselves to him from time to time as occasion arises. If he approaches the various projects with the thought and desire to have them permanent, he will frequently use concrete where in the past he has formerly used timber.

KIRKLAND LAKE PROPRIETARY DEVELOPMENTS

By ALEXANDER GRAY

Discussing the altered position underground at the Tough-Oakes properties of the Kirkland Lake Proprietary, the well-informed City Editor of *The African World*, at London, presents certain reflections on past errors of omission and commission while giving most encouraging details not as yet available to Canadians. The comment bestows upon Mr. H. S. Denny, Consulting Engineer and Vice-President of the new Tough-Oakes-Burnside operative company, the credit for having put an end to "happy-go-lucky methods" and the adoption of "a definite policy." Whoever did it, and replaced the Tough-Oakes in the middle of the road toward success, the semi-official acknowledgement is that the "ore did not keep pace with milling requirements," whereas the expectation now is that milling operations may be resumed in February, if not sooner. "Excursions" into ore of the grade indicated in the following, the "progressive policy" of Mr. Denny that has replaced the retrogressive policy as outlined, no doubt will be reflected in an increased output from the Kirkland Lake district.

"The Kirkland Lake Company is fostered by a group identified with South African and Rhodesian interests, and is being developed along lines laid down by Mr. H. S. Denny, the well-known consulting engineer, as famous on the Rand for his progressive policy, as he has become in the Canadian mining field. The Kirkland Lake property cannot be said to have been much of a success as a mining proposition until the services of Mr. Denny were requisitioned, since when the position has changed very materially for the better, and the outlook is now decidedly encouraging. It is not necessary to go into the history of the venture as it will be sufficient to say that, after a certain quantity of ore had been extracted, the ore reserves did not keep pace with the milling requirements, and the crushing plant was accordingly shut down, while attention was concentrated on underground development. The mining position was the existence of two shafts, and a good deal of driving the results of which, however, gave little payable tonnage.

"With Mr. Denny's advent the somewhat happy-go-lucky methods of underground work gave place to the carrying out of a definite policy, and the excursions into subsidiary formations were discouraged in favor of driving designed to locate what was considered the main lode. This Mr. Denny calculated should be intersected in certain positions, and the news now to hand confirms the accuracy of these anticipations. On the 7th level, a drive westward picked up indications of the main lode, and although the first 50 ft. gave poor results, since then the assays have been consistently good. After proceeding due west for some distance the lode swung to the south, and then returned to its original direction. The last cable stated that 40 feet driven averaged 34 dwts. over a width of 53 inches. This means that the lode where payable had been driven on altogether for 195 feet, and that the average value for the whole of that distance was 25 dwts. over 55 inches. Before the western boundary of the property is reached there is another 30 to 50 feet to be driven, so that it would be safe to assume that the lode on this level, on the western side of the diabase fault, will be well over 200 ft. of high-grade ore.

"With such an ore body there should be continuity both above and below the 7th level. On the 4th level some good ore was extracted some time ago. On the 5th level there were indications, but the level was driven straight westward, and probably missed the lode when it turned southward. The 6th level was not continued westward, but no doubt operations in that direction will presently be taken in hand, although at present the level is being used to explore the eastern section of the property. As the policy is to utilise diamond drilling to obtain information as to the character of the formation, it may be assumed that the continuance of the lode located on the 7th level will be proved in depth by such means. Owing to the strike of the diabase fault, southerly and easterly, the ore body may become of more importance at levels below the 7th.

"Turning to the prospects on the east of the diabase fault, where the bulk of the property lies, the 6th level, which was driven north and then east, has apparently just come into the lode, for a cable states that 14 ft. driven averages 8 1-2 dwts. over 64 inches, which indicates the entering of a good payable chute. The 7th level is also being driven eastward, and indications are reported to be decidedly encouraging. There is room in this direction for a long shoot of good grade ore.

"According to local information, a Canadian company has just been formed to take over the property. The capital of this corporation is $5,000,000, and the area acquired will be 420 acres. The present programme is to restart the mill in February, but it is not improbable that the excellent developments now being made may hasten the date, provided electric power is available. The terms which will be given to the shareholders of the present Kirkland Lake Company have not yet been made public, but it is understood they will be favourable. It is not the intention, I believe, to liquidate the present company, but to transform it from a mining concern into a holding company, while active mining operations will be conducted by the Canadian company, of which the vice-president will be Mr. H. S. Denny. This gentleman is certainly to be congratulated on the encouraging prospect of being able to add another success to those he has already secured.

Mineral Resources along Hudson Bay Railway and round Hudson Bay

Summary of Information by National Resources Intelligence Service

(Continued from page 823)

Gold

The first important mineral discovery in Northern Manitoba was the gold strike at Herb (Wekusko) lake in 1914. Since then many valuable properties have been partially financed and developed and many others examined. While gold is found throughout the mineralized area the most striking finds are reported from the eastern half at Herb lake, Little Herb lake and Elbow lake. Some of the Wekusko properties namely the Bingo, Rex, and Moosehorn mines were developed to a producing basis but the Bingo is the only mine at present actively operating. Very spectacular surface samples were obtained from Elbow lake but the persistence of values to depth has not yet been proven. Other claims have been staked on Pipestone and Little Playgreen lakes on the Nelson river and on Knee lake on the Hayes river and northwest of Amisk lake, Saskatchewan. The gold occurs in quartz veins carrying sulphide and is mined as a purely gold bearing rock or mixed with other metals.

Some pieces of vein-quartz picked up near the south side of Corbett inlet were found to carry a small amount of gold. Between Chesterfield inlet and Cape Fullerton there are several deposits of iron pyrites containing small amounts of gold. Free gold has been found in quartz at Repulse bay. Prospectors in 1912 reported placer gold on the banks of the Eastmain river. Gold is reported near Great Whale river and on the Ottawa islands.

Placer gold reported from Chipewyan lake, Churchill river, was investigated by the Geological Survey, but only meagre and isolated values were obtained.

Free gold is reported by Dr. Rae at the head of Wager inlet, west of Southampton island. There are large areas of dark basic rock carying sulphides in contact with the granite of that district which makes it a field of some promise for prospectors.

Graphite

Extensive veins of this material have been noticed in Ungava bay, also near Cape Wolstenholme and along the east side of Baffin land and some claims have been staked in the vicinity of Churchill.

Glass Sand

Quartz sand suitable for the manufacture of glass is exposed on the shores of Wapawekka lake, 150 miles northwest of The Pas.

Gypsum

Deposits of gypsum have been located on the Moose river between the Mattagami river and James bay.

Iron

Iron formations are known to exist over an extended area in the railway belt. Generally speaking they are sulphides occurring in association with Keewatin rocks and may be traced from Knee lake, one of the headwater bodies of the Hayes river, due west to Lac La Ronge in the province of Saskatchewan; occurrences, believed to be of commercial magnitude and purity, exist at various points along the Hudson bay shore line and especially on the islands of the east coast.

At Knee Lake the iron is present as a fine grained magnetite interstratified or interlaminated with schists. A sample tested about 45% iron free from titanic acid.

A loose specimen of interbanded jasper and hematite was found on the east shore of South Indian lake, Churchill river, and bog ores cover a wide area near Wapawekka lake, Saskatchewan.

Clay ironstone beds in the Pasquia hills show an iron content of 29.1%.

The Belcher islands, Hudson bay, possess formations of magnetite and hematite with which are associated iron silicate and carbonates. The formations outcrop as bands with highly ferruginous zones. Representative samples from these zones show an iron content of 35 to 45%. The high grade showings are for the most part interbedded with silicous material which would make for difficult mining operations. The ferruginous zones approximate an iron ore and more detailed examination of the field by trenching, test pits and diamond drilling might lead to the establishing of commercial bodies.

The Nastapoka group, composed of 44 islands off Richmond Gulf on the west coast, forms a valuable series of iron properties. Two of the islands are said to contain from 3 to 4 hundred million tons of the finest quality iron ore. The deposits are largely magnetite or a mixture of magnetite and hematite when associated with thin sandstone or jaspylite and siderite and ankerite where associated with the limestones. The ore beds average 7-15 feet in thickness but a depth of 80 feet of almost pure magnetite has been encountered. Manganese was present in most of the samples analysed. A large number of claims have been staked and granted. The islands are within 1-4 miles of the shore where shipping facilities and water power could be obtained.

The carbonate ores are found on the Nastapoka islands in the upper beds and on the Hopewell chain and on Long island, the greatest thickness noted being about 20 feet.

North of the Payne river, Ungava bay, there are iron-bearing beds 420 feet thick occurring as carbonates or a mixture of hematite and magnetite associated with chert and jasper. In places there are masses of pure iron but separation from the quartz would be necessary for commercial processes or quantities.

Bedded ores of low grade have also been examined in the south shores of Hudson Strait and siderite ores containing 35-47% on the Mattagami river, James bay, and a 35 % magnetite and hematite occurrence in sandstone beds, Sutton Mill lake district.

Lead

Lead is contained in the mixed ores of the Flin Flon mine and galena has been noted in small quantities at Herb (Wekusko) lake, Twin lake Athapapusko lake, in a dyke on the west side of Copper lake and at Wanipigon lake near Nelson House.

A deposit of galena carrying silver values in the Cambrian limestones in quantities sufficient to be of economic importance was traced for 12 miles from Little Whale River to Richmond Gulf, Hudson Bay. Assays gave 5.04 - 12.03 oz. silver per ton. The Hudson Bay

Company mined a lead property at the Little Whale river at one time, but workings were later abandoned.

Manganese

Important deposits of spathic iron containing manganese exist on the Nastapoka islands. A sample from Flint island showed 25.44% metallic iron and over 24% carbonate of manganese. These deposits are accessible and of promise commercially. They might be used in the manufacture of spiegeleisen.

Mica

Mica occurring in large plates of green muscovite in massive pegmatite dykes, has been observed between Talking and Island falls on the East Main river.

A Scotch whaler took out 13 tons of excellent mica from a mine at Lake Harbor, Hudson strait, in 1903.

Prospectors have also registered some claims near Churchill and a small sample was obtained from an island in Cross Lake, Nelson river.

Molybdenum

At the south end of Phantom lake in the Flin Flon area a quartz vein near the granite contact, containing pyrite, chalcopyrite and considerable molybdenite was traced for 100 feet with an average width of 3 feet. Other evidences of molybdenite have been obtained in the vicinity as well as at the Dominion claims, Brunne lake, where it occurs as flakes in fissures of the quartz, on the shores of Little Playgreen lake near the exit of the Nelson river from lake Winnipeg where the occurrence takes the form of round crystal aggregates in red pegmatite, on the Echimamish river at a contact between gneiss and intrusive rocks, on the west bank of the Grass river near Wekusko (Herb) lake, on the Eastmain coast, Hudson Bay, and as plates in syenite dykes on the Paint Hill Islands, James Bay.

Nickel

Near mile 196, Hudson Bay railway, contact of greenstone and gneiss shows mineralization of magnetite, pyrrhotite and chalcopyrite with low values in gold and nickel. Pyrite and pyrrhotite containing slight quantities of gold, silver and nickel are noted on Webb creek north of Elbow lake. These claims were only imperfectly prospected owing to the swampy nature of the district, but values obtained were not encouraging. Nickel associated with pyrites is stated to occur in veins at Camping island, 10 miles south of Priest's Point, Reindeer lake, Saskatchewan.

Oil Shales

Oil shales 150 feet thick are exposed on the Carrot river and on the northern and eastern slopes of the Pasquia hills. The beds are horizontal and would appear to underlie the entire range. Samples from surface exposures analysed 7 gallons crude oil and 20 pounds of ammonium sulphate per ton but do not of necessity represent the richest beds. The Federal Department of Mines is investigating the problem of extraction of oil from such shales. Some drilling for oil was done in 1921 near the junction of the Carrot and Man rivers.

Pigments

Mineral springs depositing ochres and numbers which might be utilized in paint manufacturing are found 150 miles northwest of The Pas at Wapawekka lake. Red ochre in small quantities but of good quality has been found on Cross lake, Saskatchewan river. Several claims are staked.

Peat

Formations of peat are widely distributed over the entire railway belt although ground ice such as is found in the more northern swamps tends to retard their formation. Amongst the bogs of commercial possibilities might be mentioned (1î north of Grand rapids, Saskatchewan river (2) between Grass river and Beaverhouse lake on Burntwood river (3) Little Churchill river near Switching river (4) on creek north of H.B. post at Split lake (5) both sides of south part of Waskaiowaka lake (6) outlet of Assean lake (7) 21 miles below the forks, Churchill river (8) Lagoons 12 miles south of Recluse lake (9) between Deer lake and Churchill river (10)northwest side of Swampy lake below Knee lake. Hayes river (11) near Clearwater lake. Mink river (12 near Swampy Portage lake between Knee and God's lakes.

Platinum

Platinum values have been obtained on the Caribou claims, west side of Brunne lake, and on claims north of Cranberry lake and near Wekusko (Herb) lake. They are not commercial deposits in themselves.

Quicksilver

Dr. Alexander Brown, surgeon at Churchill, gave evidence before a British parliamentary enquiry in 1748 that a red eaarth, obtained 36 miles south of the Churchill river, reacted like cinnabar, the ore of quicksilver.

Salt

A series of natural salt springs extends from the Carrot River valley southeast along the west side of Lake Winnipegosis and beyond. At one time crude evaporation methods were employed to obtain salt for local purposes but at present none is obtained locally.

Silver

Silver occurs in The Pas mineral belt and is recovered in connection witnh the gold and copper ores, a total of 15,510 ounces having been produced in 1920, since when production has ceased. The gold-silver-copper camps are Schist lake, Athapapuskow lake, Flin Flon lake, river, Copper and Brunne lakes. The silver content of the Flin Flon 16,000,000-ton ore body is estimated at 1.17 ounces per ton, while the treated ore from the Mandy mine showed 2½ ounces per ton.

Silver-lead ores are also reported from Pukkatawagan or Cold lake, from northeast of Herb lake, from the Copper and Brunne Lake district, and from Wanipigon lake north of Nelson House. Segregated pyrite in the squeezed trap of the Paint Hill area carry small silver values. Galena showing silver values of 5.04 - 12.00 ounces per ton from samples has been traced for 12 miles from Little Whale river to Richmond Gulf.

Sulphur

The presence of large and widespread iron and copper sulphide bodies at various points in the Keewatin belts suggests a possible source of sulphuric acid or sulphur. Among the sulphides found in the railway belt, on the Churchill river and along the coast are iron pyrites, chalcopyrite, bornite, arsenopyrite, sphalerite (zinc blende) stibnite (sulphide of antimony) and pyrrhotite.

Many of the properties on Ross lake, northeast of Schist lake, on the Pineroot river, at the north end of lake Athapapuskow, and on Brunne and Copper lakes show characteristic occurrences of iron pyrites in extensive zones and bands, associated in part with copper values, in origin similar to the Flin Flon and Mandy ore bodies.

Iron pyrites appear in the limestones of Long island, on the Eastmain river and on the islands north of Cape

Jones, and in the Paint Hill group; the vicinity of Mosquito bay, north of Portland Promontory appears to be an area favourable to these sulphides. Pyrites has also been noted on the west coast near Corbett inlet in Mistake bay and other places.

Talc

Soapstone obtained near Mosquito bay is used by the Eskimos of the East coast for making utensils. A possible source of material for fire clay is found in the pipestone from Wapawekka lake, Saskatchewan, 150 miles northwest of The Pas

Zinc

Zinc is associated as sphalerite with the copper sulphide ores of The Pas mineral belt, the Flin Flon mine showing an average zinc content of 3½% while the ore of the Mandy mine runs about 20% zinc. It is also associated with calcspar in veins south of Little Whale river and as crystals in galena on this part of the coast.

PROSPECTOR, GEOLOGIST, AND ENGINEER

During a discussion of present-day prospecting at an A. I. M. M. E. meeting in San Francisco last year, Dr. Andrew C. Lawson, formerly of the Canadian Geological Survey and now professor of geology at Leland Stanford, contributed the following pertinent remarks:

"In recent years geology is becoming recognized as the means to the finding of ore. Only a limited number of people can be good geologists. We can train men, but unless they have an aptitude for that work, they do not make really good geologists. If we train a man in the technique of geology, he will be useful to the mining industry in the finding of orebodies, provided that the people who want orebodies are willing to pay for his services; that condition does not exist at the present time. People willing to employ a good geologist today not only must pay him an attractive salary, but they must not expect that every time he makes a trial he will be successful. There will be a large percentage of failures. We should do our best to make the prospector a good geologist, and make the work of looking for mines attractive to him. The oil men are employing geologists. It is hard to keep students at Berkeley because of the large salaries paid by the oil people; and because of this the country is flooded with boys who call themselves experts. More than three-quarters of the boys are incompetent to do their work, but they have the confidence of boards of directors. The country is full of such men who in time will not make a good livelihood out of their geological work; their training is too narrow. The only way to get a man to meet the various conditions that would be encountered in looking for a mine is to make of him a good geologist."

On the same occasion Professor J. C. Jones of Mackay School of Mines had this to say of the prospector:

"The old-time prospectors went out and searched for mines. They had no particular school training, but they were among the keenest of observers and learned their geology by experience; that is, in the mines. When they were confronted by a set of conditions they looked into them. If anything went wrong in one place, they moved to another; and each time they made a mistake they learned something until they became quite fair geologists. They might not have called rocks by the names we do, but they had the knowledge necessary to find the mines. While a sound training in geology is of great value, there are limitations to the science. In civil engineering, for instance, the engineer is used to dealing with exact mathematical facts; the geologist is not. He is at times confronted with certain elements of uncertainty even when facts have been fairly well established; for instance, when it comes to foretelling the value of the ore that one is going to find, or deciding whether or not there is any ore.

"Every January, at the Mackay School of Mines we have a four-weeks' course, known as the prospector's short course. In that course, the prospectors get a series of lectures in which sufficient detail work is given so that they have an inkling of our present ideas. They get a little geology and mineralogy, a little first aid and hygiene, a little mining law, surveying, gas-engine work, assaying and chemistry, and while at the end of that time they are not college graduates, they have learned something which, when applied to their own observations, proves to be of great help to them."

In discussing the relation of the large mining coporation to the prospector, Mr. P. G. Spilsbury, of Phoenix, Arizona, said, in part:

"We have been trying to encourage the prospectors by giving them facts. We will go out with any man who has a reasonable proposition, and if his property is worthless, we try to show him why. We spend much time trying to show prospectors, who are on worthless ground, why they cannot make a mine. We have, in this way, been able to do some good. Furteen or fifteen of these men come into our office regularly for advice. They bring in their propositions and we talk them over, not with the idea that we will buy them, but that we are there to help them. We do not give any course in geology, but our geologist explains to them, if necessary, what the requirements are for success. We help these men a little financially. We get much information about districts that could not be secured in any other way, and I believe this is one of the methods by which we can work with the prospector. We cannot make him highly educated as he has not the basis; but if we can secure his confidence, give him a square deal, and try to show him where he can do his best, we can encourage his work and possibly get results from it.

"When a prospector brings in information regarding his property, we first determine if there is a faint possibility of its being of interest. If we decide affirmatively, we send out our field man to make a preliminary examination. This man is a very good observer and brings his information to the office. This is considered by my geologist and myself. If worthless, we determine why and drop it. If there is a possibility of making a mine out of it, the geologist makes another examination. If his word is unfavorable, we drop the proposition giving, in our report, the full reasons for our decision. If his report is favorable, my field man, geologist, and I visit the property and go over it thoroughly. The final report therefore is the opinion of a prospector, a geologist, and a business man. If the property proves hopeless, we always tell the owner why we consider it so and give him the benefit of our information.

"Only about 60 per cent. of the prospectors whose properties we decide are worthless take the explanation in the right spirit. The prospectors who are getting to know us are gradually realizing that it is our job to help them and that in this way we will gain results. We believe in the work of the prospector and we are giving him all the help and encouragement possible."

POLYTECHNIC AT ANYOX

Classes in a wide variety of subjects, from English to Metallurgy, have been inaugurated in Anyox, B. C., under the wing of the Northern British Columbia Polytechnic Institute. The Granby Company and the local technical staff are backing the new school.

The Coal Trade of America and Europe

By ALEXANDER V. DYE, in Commerce Reports

Th only practical sources of power on a commercial scale are coal, petroleum, natural gas, and water, and a recent comparison made by a German statistician shows that of the 177,600,000 horsepower obtained from these sources in 1919 coal furnished 160,600,000. From this it will be seen that in spite of the recent increase in the use of petroleum, coal still remains the dominant driving force of the world.

Another reason why coal should interest the average business man is because about 90 per cent of the world's coal comes, from only two areas which, while large in themselves, are very small compared to the total surface of the earth. One of these areas embraces the coal fields of the eastern part of the United States and the other includes Great Britain, Germany, Belgium, and northern France. Likewise the greater portion of the world's commerce moves to and from these two areas or back and forth within them.

Relative Production of Europe and America

The European area supplies about 50 per cent of the world's coal and about 40 per cent comes from the United States fields, although these proportions are rapidly changing. The coal trade was developed much earlier in the European area as an integral part of the development of steam power and manufactures. In fact, as late as 1860 Great Britain alone produced four-fifths of the world's coal and while British output increased steadily until in 1913 it reached its peak with a production of 287,000,000 tons, its proportion of the world's production sank steadily from 80 per cent in 1860 to 21 per cent in 1913. This relative decrease in the development and control of the driving power of the world was principally due to the economic rise and development of the United States and Germany, with the coal development of France, Belgium, Austria, and the rest of the world as contributing factors.

Side by side with this change in proportion of total output, there has been a steady decline in the output per man in Europe and an increase in the output per man in the United States. At the present time, generally speaking, one coal worker in the United States produces about three times as much coal in the year as a European worker. This is due to man reasons among which may be stated that, in the first place, the coal seams in America are closer to the earth's surface and are flatter and thicker. In Europe many small shafts were sunk and narrow haulage ways driven before experience had shown the economy of mining operations on a large scale with large shafts and wide haulage ways. Labor-saving machinery is used to a far greater extent in America, about 60 per cent of American coal being mined by machinery and only about 15 per cent of European coal. However, in addition to all these factors it seems probable that the American miner actually works harder.

Results of Shorter Working-Day

After the war coal was scarce in Europe, but the coal miners in European countries cut their working-day from eight to seven hours just at the time when coal was needed most to start driving again the wheels of commerce. The consequence has been that a steadily increasing number of men had to be employed to produce the same amount of coal. In England the production of coal per man per day averages about 0.9 ton; in Germany it is about 0.6 ton, and in France and Belgium slightly more.

This means higher overhead costs, as water constantly trickles into the mine workings and must be pumped out, the underground pressure cracks timbers which must be replaced, and the earth loosens and falls into the workings. Thus before the war, in England, for every 1,000 men who were actually digging coal at the face about 1,100 men were doing the other necessary work about the mine. Now, since the hours of all workers have been reduced, for every 1,000 men digging coal it takes 1,500 to do the other work. As a result it takes more people to do the coal mining for the country. The output of coal in Great Britain was almost exactly the same in 1922 (252,000,000 tons) as in 1906, but in 1922, 1,100,000 men were employed to mine it as against 875,000 in 1906. On the other hand each worker receives about 45 per cent more wages than he did in 1913, so that with the decreased output the price of coal must remain high.

Earnings of British Miners

In Great Britain during the first quarter of 1923, 1,087,733 workers in the coal mines produced 67,077,543 tons of saleable coal which sold for £58,156,716, or at the current rate of exchange $267,518,409, a little less than $4 a ton. Judging by the figures for the first quarter, each of these million-odd workers will be employed 280 days during the present year and produce 252 tons of coal worth about $1,000. If this year's production is worth only $1,000 it is obvious that his wages would be considerably lower than this amount. As a matter of fact each worker received on an average $2.22 per day (at current rates of exchange) and although his wages will probably be higher during the remainder of the year it is safe to say his year's income will not exceed $700.

In Germany, France, and Belguim the situation is much the same. The small output per man makes the price of coal high for manufacturing purposes so that Europe can not sell cheaply enough to dispose of its goods and thus obtain money to buy more American raw material. The result is that commerce is slowed down at the start.

Future Outlook

In the meantime the British coal trade carries on and it will always meet American competition, because it must, in the markets that are necessary, particularly those of northern Europe. Coal forms 80 per cent in weight and 10 per cent in value of all outbound cargoes from Great Britain. About 30 per cent of all coal mined in England is exported either as ships' bunkers or cargo coal. This export is vital to British economic life and will be maintained under any circumstances.

It seems probable that American coal exports will become entrenched in the south of Europe and take some markets formerly considered as British preserves, provided the price and transportation facilities are favorable. A number of large British coal exporters, seeing the trend of trade, are opening offices in New York in order that they may be in a position to handle American coaling markets where they can not sell the British product.

Technically Directed Prospecting

Augustus Locke Advocates Adopting Scientific Method in the Search for Ore

In a paper issued with *Mining and Metallurgy* for August, 1923, Augustus Locke of San Francisco discusses "Present Tendencies in Exploration for New Mines". As much that he says is pertinent to exploration in both eastern and western Canada, the second part of the paper is presented here, in abstract. Especially does Mr. Locke dwell on one point that has been emphasized on numerous occasions by the *Canadian Mining Journal* — that trained mining engineers should and will take hold of prospecting in the near future as they have taken hold of mining operations in the recent past, and so organize and direct the search for new ore-bodies that the chances of finding them will be much enhanced. Mr. Locke says, in part:

Stages of Prospecting

Ore discovery in western North America falls into three periods: first, the discovery of great, new districts — a feature of the advancing frontier; second, the discovery of new mines in old districts; third, the discovery of new ore in old mines, near known ore. The United States is now in the third period. Are the new mines, then, like the new lands, all taken? We cannot accept this conclusion without close examination. It may be there are many new mines awaiting the advent of a finer ore-hunting art.

There are many kinds of hidden ore. Much lies covered by drift and, in Canada, by moss and water. In arid districts such ore is sometimes visible at the edge of the drift, but in forested areas the cover is more continuous and the search more baffling. Geological knowledge, aided by small drilling outfits, will improve present methods. The study of physiography, too, will help, and we must not neglect the possibility of aid from electrical devices.

Concealed Outcrops of Ore

Bulky, conspicuous croppings, with iron and copper stain, have been the copper hunter's favorite; they lie broadside to the sky. We shall find few new mines by this means. If, however, the ore is especially high in pyrite or low in neutralizer (such as calcite or feldspar) the evidence of copper may be obscured. If, again, the ore is low in iron or lies in a forested country where organic acids can dissolve the limonite from the surface, the cropping may even be further obscured.

Irregular garnet-limestone ore deposits, which have croppings of high-grade shipping ore that soon pinch out, attract the prospector but repel the engineer, and have given certain districts a bad reputation. Yet alongside these may lie rich limestone ore that weathers easily and is covered. The garnet croppings may indicate hidden riches.

Some sulphide deposits, such as that of Kyshtein in Russia, may weather to a sand, which is easily passed over by the prospector.

In general, small, rich ore-bodies seem more liable to discovery in the future than large,low-grade ones. Steep-dipping bodies like the United Verde remain undiscovered longer than flat-lying deposits such as those of Miami. Rich, secondary ore near the surface is found more easily than the deep, primary deposits. Veins will be found in the future oftener than massive deposits, for veins may appear on the surface as thin discontinuous lines, and may lie with their big ends buried in the rocks. Butte is an illustration, the veins there have been discovered less on the surface than underground, and the surface is in sharp contrast to Miami, whose red hills show up miles away.

Hidden and Unusual Ore Bodies

Deposits that fail to outcrop, such as those in flat beds or flat-lying fractures; veins that are barren at the surface but whose geological associations and grade of ore improve underground; deep-lying ore terminated by a fault near the surface; these in some measure are saved for the future. Other deposits may be overlooked temporarily because of more spectacular outcrops near them; if these latter fail to make good, then those of poorer appearance are condemned, though they may really be of better grade.

Deposits of unusual types, of which no example has been recorded on this continent, may go long unheeded. In other cases the usual guides may be missing. Thus, though the prospector usually traces and locates a gold deposit through its local placers, glaciation may have removed this guide. Silver deposits, such as those of Tonopah or Pachwea, may be hidden by a cap of later, barren rock, to be discovered only by some lucky chance, or perhaps by means of some future scientific aid to prospecting.

Ore bodies to whose origin no definite cause can be assigned, that is those to which no specific guides are known, compose a large class. In the past the search for such deposits, especially in new districts, has been without logic technical aid, and mere physical energy has been the prospector's chief stock-in-trade. It seems certain that progress in the study of ore-deposits and of geology in general will provide some guides to these occurrences, which will convert the prospectors' work from a blind to a logical search.

Condemned Prospects

Then these are prospects that have been condemned on the strength of a little underground work. A few unlucky drill-holes may prejudice the engineer against a hundred acres of mineralized ground. Unless these holes are so placed as to be typical of the whole section, little real information has been gained. Many deposits that later have made mines have been thus condemned, and more await the further investigation that will turn failure into success.

Many more examples such as these could be cited. It is typical of them that they are valuable ore-deposits that lie unseen by the multitude and have been passed over by the pioneer prospector. Their discovery will be the result of careful and logical search.

The Examining Engineer of Today

What is the present practice? It is not, in general, a careful and logical search. The average prospector works much as he has always done, though with less spirit than formerly. We who act as examining engineers are only better educated and less patient pros-

pectors; we are better business men and can express an opinion more plainly, but we, too, are hoping, like the prospector, to come at last, through mere physical activity, to the happy valley where obvious signs of ore will lie before our eyes. This is a false hope. The prospecting of the future must include more than physical energy and financial competency. It must involve a study of questions now avoided, a collecting of all available evidence in advance of actual exploration and the expulsion from one's mind of all unreasoning prejudice, one way or the other. It must be so thorough that no chance for ore which is, in the mining sense, a good speculation, is lost through mental apathy, shallow thinking or hurry.

Prospector of the Future

This scheme for the future will involve a radical departure from present practice. How can it be brought about? It can be effected only by the man of science. He is as necessary here as in the chemical industries. To some small extent he is already in the prospecting business, chiefly as a geologist with a purely scientific object in view. Nevertheless there is evidence that the study of ore-deposits is being applied actively in the search of the prospector to a small extent. Certain men who direct exploration are commencing to realize the advisability of employing the best technicians they can find. They realize that the discovery of a given prospect is not merely an isolated event, but is part of a larger problem. They are likely, in time, to give their full support to schemes of action involving this larger problem.

The search for new mines will become a studied, deliberative affair. Not much longer will it be considered good practice to allow scouts to examine prospects, so many in a month, in separated districts. These scouts will be instructed to conduct their examinations, not so much prospect by prospect as district by district. Under certain conditions they will subject particular districts to long and careful study.

The technical control of exploration seems be on the way. Its usefulness is questioned by the man on the street, chiefly because ore discovery is at best a speculative affair. But there is a difference between one chance in fifty and ore in a hundred, though both are speculative. Technically directed prospecting promises, before the lapse of twenty years, a reduction of the speculative risk in something like this proportion.

AMMONIA LEACHING IN CHILE

If industrial tests to be made soon on a large scale confirm eminently successful laboratory experiments, and prove the claims made for a purely chemical process to reduce copper ore devised by a Chilean, Dr. Eduardo Solovera, copper production from low-grade ores will be revolutionized, and Chile will probably become not only the largest copper-producing country in the world but also a very large producer of aluminium and gypsum as by-products.

The advantages claimed for the Solovera process are that it requires only a fraction of the investment needed by electrolytic methods, and that the average production costs, under Chilean conditions, will be reduced from $200 to $70 a ton of metallic copper. This production cost will be greatly lowered, and in favourable cases more than completely covered, by the sale of by-products.

The process involves leaching the ore, when necessary, with dilute sulphuric acid (some Chilean copper ores, including that at Chuquicamata, are self-leaching and do not require the use of acid), which results in instantaneous precipitation of basic salts of copper by means of ammonium hydrate; a recuperation of the reagent (ammonia) follows, together with the production of calcium sulphate (gypsum) and aluminium oxide, both lime and alumina being part of the composition of Chilean copper ores, the "Teniente" ore mineral containing 20 per cent. of the latter.

In the tests the copper hydroxide precipitate, which may easily be reduced by known methods, has never been of less than 65 per cent. and it has often reached the theoretical maximum of 80 per cent. metallic content.

The use of ammonia in the reduction of copper compounds is current in laboratory practice, but, because of its high price, it has never been available in the industrial production of copper. The essential value of the Solovera process is that it permits the integral recuperation of the ammonia at a very nominal cost, and that in the course of the operation valuable by-products—aluminium oxide and gypsum—are produced.

Some years ago the Chilean Government endeavoured to break the Guggenheim-Anaconda monopoly by attacking the validity of its electrolytic patents in the Chilean Courts for reasons of public interests, but failed, and thus the combine was able to practically eliminate competition by independent concerns, and hence to restrict production in a way which Chileans consider detrimental to their interests.

The Nitrates & Mining School of Antofagasta, the Chilean Institute of Mining Engineers, and the Scientific Association of Chile, under whose auspices tests of the process have been made, have urged the Chilean Government to take steps to prevent the patents from falling into the hands of the copper combine, so that they may remain available for the creation of a Chilean copper industry independent of foreign control.—*The Mining Journal.*

PERSONAL AND GENERAL

Mr. D. H. MacDougall has been appointed consulting engineer to the McIntyre Mines, who own coal mines in Alberta.

Mr. D. T. Burns, of the Koppers Company, of Pittsburgh, is in Sydney to oversee the initial heating of the new battery of the Koppers by-product coke ovens.

Dr. E. L. Bruce made a geologist survey for the Ontario Department of Mines during the past season in the Red Lake area, not far from the Manitoba boundary. The reputed silver discovery consists of a narrow vein containing galena, which carries low values in silver. A party of prospectors from the Cobalt district went to Red Lake last spring, on the strength of the reported find. They determined at once that the reports were without foundation, but proceeded to spend the season in general prospecting. The result is that they have found a number of narrow gold-bearing quartz veins in a geological association identical with that of Porcupine. Temiskaming sediments and rocks of Keewatin age are cut by syenite and porphyry, and are enclosed in the granite batholith. Dr. Bruce has mapped an area 30 miles by 10 miles, which will be an adequate preparation for detailed prospecting if the area should prove to be of importance.

On Friday of last week Dr. W. L. Goodwin was presented by his former students with a protrait of himself, painted by Mr G. Horne Russell, the occasion being the fall convocation of Queen's University, Kingston.

SHORTAGE OF LABOR ON THE RAND

During August 769,371 ounces of fine gold were produced by the mines of the Transvaal, an increase of 15,065 ounces over the July output. Priced at 88s. an ounce, an increase of 4d. over the preceding month, valuation of gold was officially declared at £3,385,232. as against £3,300,088 for July. Working costs in the mines are being further reduced.

Increasing shortage of native labor in the Rand has lowered the production of several mines—the Crown Mines, which have the largest output on the Rand, and the Simmer and Jack Mine finding it necessary to close down over week ends. A slight improvement was noted in native labor, 167,600 being employed in the gold mines at the end of August, an increase of 1,167 over July. More Portuguese natives are being recruited, but the mines are still short some 15,000 workers of this class.

The failure to obtain sufficient natives has adversely affected the employment of whites, not only in the mines but in certain other industries. Premier Smuts recently announced that the Government was spending £16,000,000 on reproductive works, such as railway construction and afforestation, for the relief of white unemployment. Although wages of 9s. to 10s. a day are offered, it has been difficult to induce men to leave the towns for the country, necessitating the employment of natives. — Commerce Reports.

FINAL STATISTICS, 1922, ON PETROLEUM AND NON-METALLICS

The Dominion Bureau of Statistics has issued the following finally revised statistics on the production of crude petroleum and miscellaneous non-metallic minerals in Canada during 1922, under date of October 10th.

Petroleum

The production of crude petroleum in Canada in 1922 amounted to 179,068 barrels having a sales value of $520,073. Government bounties on these sales amounted to $91,103 making the total value $611,176 to the producers. In 1921, the production was 187,541 barrels having a total value of $641,533. The average market value per barrels, in 1922was $2.90 while in 1921 it was $2.92.

Crude Petroleum in Canada, by Fields, 1922

Field	Quantity in Barrels Tons	Value less Bounty $	Bounty Paid $	Total Value $
New Brunswick	7,778	28,359	4,373	32,732
Ontario:				
Petrolia & Enniskillen	64,935	173,375	34,091	217,466
Oil Springs	43,214	115,380	22,687	138,067
Moore Township	7,275	19,424	3,819	23,243
Sarnia Township	3,224	8,607	1,692	10,299
Plympton Township	695	1,856	365	2,221
Bothwell	25,681	68,568	13,482	82,050
Tilbury East	127	338	67	405
West Dover	5,482	14,638	2,878	17,516
Raleigh Township	663	1,771	348	2,119
Dutton	387	1,033	203	1,236
Onondaga	489	1,307	257	1,564
Moza Township	11,959	31,932	6,279	38,211
Thamesville	383	1,024	202	1,226
Dawn Township	217	579	114	693
Total for Ontario	164,731	439,832	86,484	526,316
Alberta	6,559	51,882	246	52,128
Total for Canada	179,068	520,073	91,103	611,176

Miscellaneous Non-Metallic Minerals

The Dominion Bureau of Statistics issues the following finally revised statistics on the production of Non-Metallic Minerals in Canada during 1922.

With the exception of arsenic there were no outstanding differences between the production of 1922 and the previous year of the commodities listed in the table below as miscellaneous non-metallic minerals.

The production of arsenic in 1922 was 2,576 tons, an increase of 1,085 tons or 42% when compared with 1921. Large quantities of this commodity are being used in the United States for insecticides which are found to be particularly effective in combating the boll weevil, an insect which has caused great damage in the cotton districts during recent years.

		1922	
		Quantity	Value
Actinolite	Tons	50	575 $
Arsenic (white) produced from Canadian ores	Tons	2,576	321,037
Barytes	Tons	289	9,537
Chromite	Tons	767	11,503
Feldspar	Tons	27,727	248,402
Fluorspar	Tons	4,505	102,138
Graphite	Tons	597	31,353
Grindstones	Tons	1,005	43,742
Magnesite	Tons	2,849	76,294
Magnesium sulphate	Tons	1,021	24,017
Manganese	Tons	73	2,044
Mica	Tons	3,349	152,263
Mineral water	Gals	221,433	14,220
Natro-Alunite	Tons	50	2,500
Iron oxides	Tons	7,285	110,608
Peat	Tons	3,000	14,500
Phosphate	Tons	190	1,796
Pyrites	Tons	18,143	74,303
Quartz	Tons	109,947	208,598
Sodium carbonate	Tons	202	3,027
Sodium sulphate	Tons	504	11,980
Talc	Tons	13,195	188,458
Tripolite	Tons	219	5,781
TOTAL			1,658,676

EARNING POWER OF RESEARCH

Originally, the lead from which cable sheaths are made was given a 3 per cent admixture of tin to obtain the necessary mechanical properties in the alloy. About twelve years ago the price of tin advanced, while the increase in the quantity required for new telephone cable construction became so large that research was called upon to provide a substitute. As a result new sheaths contain one per cent of antimony and in ten years the new formula has earned a saving approximating $6,000,000.

Another important metallurgical result was an improved contact metal used in the millions of relays and tiny switches required in telephone plants and central stations. Since 1916 this new metal has earned through savings about $13,000,000.

Another illustration of the earning power of research taken from the experience of the Bell system is the use of so-called phantom circuits. A simple circuit consists of two line wires. In phantoming it is possible to superimpose a third circuit upon two pairs of such wires, utilizing each pair as if it were a single line wire. At present there are about 400,000 miles of phantom circuit in the Bell system. The cost involved in obtaining these phantom circuits was about $9,000,000, but the cost of the additional copper wire necessary to string simple circuits to do this work would have been $90,000,000.

These earnings are real and the income upon the investment in research which makes them possible is greater than that usually obtained in commercial ventures.—

Industrial and Engineering Chemistry.

NEW GEOLOGICAL SURVEY INDEX

The Geological Survey has just issued an *Index to Separate Reports,* 1906,-1910, *and Summary Reports,* 1905-1916, by F. J. Nicolas. In 1908 the Survey issued a general index to reports up to 1904. There was, at that time, a half-promise that the index would be brought up to date every ten years. The 1908 index was commended highly by this and other journals; but the London *Times* remarked that the number of pages indexed was scarcely 13,000 and the pages in the index amounted to over 1,000—an undue proportion of references. The present index covers about 10,000 pages, from 1905 to 1916, and consists of 300 pages—a much more reasonable proportion. In 1910 the series of separate reports was terminated, to be carried on as monographs, thus accounting for the apparent inconsistency in the dates shown in the title.

The work has been compiled, evidently, with great skill and care and by one with a thorough knowledge of the art of indexing—an art so little understood by the average writer, but so much appreciated by readers. The author, in his preface, acknowledges the constant and willing aid of his confrères of the Geological Survey, who must therefore share in the congratulations due for this excellent piece of work.

The present index does not include the memoirs (the Survey's chief record) or the bulletins. There remains, therefore, to be prepared an index that will cover the whole of the Survey's recorded accomplishments up to a recent date. One may hope, on behalf of the geologists and mining engineers who will make good use of such a work that it also may be compiled by the author of the present index.

NEW SOAPSTONE DEPOSIT

A new deposit of soapstone has been discovered on Trap Lake, a small lake south of Wabigoon lake, in northwestern Ontario. The quality of the stone has been reported as excellent for various industrial uses, and practical trials are under way. Water transportation is available direct from the deposits to Wabigoon and Dryden on the main line of the Canadian Pacific Railway.

USES OF ARSENIC

During 1922 about 8,000 tons of calcium arsenate was distributed to cotton growers in the Southern States to help fight the boll weevil. It was first used for that purpose in 1919. Lead arsenate is the chief arsenic compound used; during 1922 about five times as much was used in the United States as all other arsenical compounds combined, including calcium arsenate, Paris green and Bordeaux mixture. Of this the manufacture of plate glass consumed 1,500 tons. The manufacture of weed killers, sheep dips and numerous minor uses consumes smaller quantities annually.

OCHRE IN WALES

It is reported that important deposits of ochre have been discovered in Wales, which it is expected will go a long way towards making British manufacturers of paints, linoleum, etc. independent of imported ochre.

The weight of the petroleum imported into Great Britain in 1922 exceeded that of any other raw material; iron ore ranked second.

SOME NOTES ON MINING IN EUROPE

Remarkable progress has been achieved in the reconstruction of the French mining industry, systematically destroyed in war-time by the invading Germans, according to George S. Rice, chief mining engineer of the United States Bureau of Mines. Mr. Rice has just returned after completing a study, occupying several months, of conditions in the mining industries of France, Great Britain, Belgium, Germany, Poland, and Czechoslovakia. As a result of the splendid engineering skill employed in the restoration work, some of the finest coal-mining plants in the world have been constructed in the north of France, states Mr. Rice in a report made to Director H. Foster Bain of the Bureau of Mines. Thousands of miners' houses have been built, replacing those destroyed. These houses are quite attractive and most of them have gardens, which have been redeemed from trenched and blasted ground. Much attention has been paid to welfare projects, with the result that the miners of northern France are undoubtedly better housed than miners in any other part of the world. Underground, the mines have been recovered to such an extent that they are producing about 70 per cent. of the normal coal output. When all the water has been pumped out of the mines, the coal production of northern France will be greatly increased over that of the pre-war period. Ingenious cementation methods have been employed in the restoration of mine shafts in which the iron linings had been destroyed, thus flooding the mines.

Mining Petroleum Sands

Novel methods for obtaining petroleum, involving the mining of oil sands and their subsequent treatment at the surface, were observed by Mr. Rice in Alsace and near Hanover. This makes possible a greater recovery of the petroleum, two-thirds of which, it is estimated, is left in the ground after ordinary extraction by wells.

In England, Mr. Rice had the opportunity of observing the experiments directed by Oxford and Birmingham Universities regarding the health and working capacity of miners employed in excessively hot mines. As the result of the researches of Dr. J. S. Haldane, eminent mine physiologist, it has been found that miners working in hot atmospheres lose chlorides rapidly, which is very weakening. The energy of the workers, it has been found, can to a great extent be re-established by the taking of salt in water, or some other liquid.

Profit-Sharing in English Collieries

An interesting sociological development in the coal-mining industry of Great Britain, whereby the mine owners and the miners share in the distribution of profits, was studied by Mr. Rice. Under this plan, the mines are grouped in certain districts and monthly, in each designated district, the gross total expenses of production of the coal are deducted from the gross profits of the mines of that district and from this gross net profit there is deducted 6 per cent of the invested capital; the remainder, if any is divided between the owners and miners, the owners receiving 17 1-2 per cent and the miners 82 1-2 per cent. The miners' share, if any, is pro-rated among the miners of the district and the amount thus determined by certified accountants is paid to the miners two months later in the form of an increase in wages.

Interesting developments in the problem of surface subsidence resulting from mining operations were observed in Great Britain and France. At St. Etienne, France, mines have passed under important buildings which have been sunk as much as 20 feet without material damage, because of the careful packing methods em-

ployed. The mine subsidence problem is one of growing seriousness in various European countries. The British Parliament has recently established a commission to study the situation, with a view to recommending special remedial legislation.

Stone Dusting Compulsory

In Great Britain and France, the employment of rock dust as a screen or barrier for the limitation of coal dust explosions to the immediate area of the explosion has been made compulsory. The efficacy of this method was strikingly demonstrated in the case of a gas explosion in a Yorkshire colliery where the stone dusting confined the explosion to its immediate place of origin and prevented the great loss of life that must have occurred had the explosion spread through the mine. Much experimental work along this line has been performed in the United States by the Bueau of Mines, Mr. Rice points out, but the States have as yet enacted no legislation to compel the adoption of this system in the mines of the country.

Liquid Oxygen Explosive

Liquid oxygen explosives are being extensively used in France and Germany in metal mining and quarrying operations. This type of explosive is not, however, being employed in coal mines because of the assumed danger of causing coal dust explosions. Tests employing liquid oxygen explosives in quarries and metal mines in the United States are now being made by the Bureau of Mines at Pittsburgh, Pa., and at other field stations.

Advances in Coal Technology

Mr. Rice found that research into the causes and prevention of mine explosions had been virtually stopped in Europe during the war-time period and had not been fully resumed in continental countries except that in France the fundamentals of safety explosives are being studied. In Great Britain, research along this line has been resumed at the Eskmeals experimental station and also at several of the universities. In the study of the use of stone dust in the limitation of mine explosions, the English investigators have made greater progress than has been achieved in the United States.

In France, it was observed that powdered coal has been widely adopted as a fuel. In Germany, near Hanover, novel methods are being employed in the distillation of brown coal, a lignite quite different from American lignites, from which various valuable oils, paraffin, and gas are being obtained. At Whitehaven, England, coal is being mined under the sea at a point 4 1-2 miles from the shore line.

Owing to the scarcity of timber, various substitutes are being employed in the different countries for mine props. Steel props and steel arches are being used extensively to hold up mine roofs. In Belgium, mine shafts in wet, "running" ground are being constructed largely by the freezing process, in which the ground is frozen and made easier of excavation through the medium of refrigerated brine forced through pipes surrounding the area to be excavated. Shafts more than 600 feet in depth have been sunk by this method. A great amount of information bearing directly on other mining problems forming a part of the investigative program of the Bureau of Mines was obtained by Mr. Rice.

International Co-operation in Research Proposed

Mr. Rice reports that the research agencies of the various European governments were greatly interested in the experiment of the Bureau of Mines and other scientific bureaus of the American Government and were quite anxious to co-operate in the study of different problems. As a representative of an American governmental research organization he was given an extremely cordial reception by the scientfic workers of all countries visited. As a result of his visit to England, the British Government has already proposed, through the State Department, that a joint program f research, covering various mining problems, be adopted. This program would include the exchange of technical information, of materials under test, of scientific apparatus, and possibly of research personnel. This proposal has been accepted by Secretary Work.

THE PROBLEM OF MINE VENTILATION

Many metal mines in the United States have unsatisfactory ventilation systems, with the result that employees frequently work under conditions which are unhealthful and which materially reduce efficiency, states the United States Bureau of Mines as the result of studies made by its engineers. High temperatures and humidities, which unduly deplete the miners' vitality, and prevent his working full time and which may undermine his health, are encountered in many mines. Workers at faces frequently breathe air impregnated with large quantities of fine mineral dusts. Physical examinations of such workers indicate that the continued breathing of such air injuriously affect the health of workers, especially if the air is stagnant, or hot and stagnant. While siliceous dust is probably the most dangerous, dusts low in silica are also known to be harmful. In some instances, the air in mines has been found to be unduly depleted of oxygen or to have a high content of gases such as carbon dioxide or even of the poisonous carbon monoxide.

Remedial measures suggested by the Bureau of Mines are the adoption of mechanical ventilating methods giving circulation of pure air at working faces, together with the use of devices and methods for reduction of air dustiness, including the use of wet drills and the sprinkling of mine workings, muck piles, etc. While much remains to be done in many mines and mining districts to attain a reasonable degree of safety and efficiency along the above lines, especially in the application of proper measures, not a few metal mines throughout the country have adopted all or some of the bureau's recommendations for better ventilation and dust elimination. In one mining district where health and efficiency were especially poor due to underground conditions, the many changes towards better ventilation and reductions of air dustiness caused a large insurance company to reduce premium rates as much as 50 per cent.

STRONTIUM

The commercial source of strontium is the minerals celestite (strontium sulphate) and strontianite (strontium carbonate), the former being the more common. A recent report lists the ground mineral at $80 per ton in the United States. About 2,000 tons is used there annually. This amount would be increased largely were a beet sugar industry established, as this provides the chief use for strontium salts. Coloured fireworks and signals and certain medicines constitute the other uses.

MOLYBDENITE

Molybdenite is found in the contact zone of pegmatite granite with crystalline limestone, where it is commonly associated with pyrite, pyrrhotite, pyroxene (diopside), and scapolite. It is also found in the pegmatite dikes themselves, and, sometimes, in aplite dikes. Ores containing as low as one per cent of molybdenite can be worked at a profit since the oil flotation process has been applied to the mineral.

THE MINING DISTRICTS

By THE JOURNAL'S CORRESPONDENTS

NORTHERN ONTARIO

South Lorrain.—During the month of September Keeley Mines in South Lorrain produced 135,400 ounces of silver. The enlargement of the mill is practically completed, and within the next couple of weeks the company should be in a position to treat 140 tons a day, which will materially increase the output. Development work is proceeding on the 8th level, and within a few weeks the drift should be under the famous ore-shoot on the 7th level of No. 26 vein. The new level is particularly important, as it will determine whether or not the zone of secondary enrichment has any further depth. No. 26 vein produced over 300,000 ounces from a short drift, the vein in one place having a width of approximately 5 feet of high-grade ore running about 7,000 ounces a ton. The company has about 200,000 ounces of high-grade ore stored underground.

Engineers of the T. & N.O.Ry. Commission have started trial survey lines from Cobalt to South Lorrain. Three different routes will be surveyed, the one from North Cobalt following the line of the motor road, another from the end of the Kerr Lake branch of the Nipissing Central and the third leaving the main line three miles South of Cobalt station. It is believed that the last route is the most feasible, but this cannot be accurately determined until the surveys are completed. The Government appears to be much impressed with the importance of the South Lorrain district, and it is altogether probable that the line will be constructed. Such a line would not only provide adequate transportion to the Gillies Limit and South Lorrain, but would also permit milling ores from South Lorrain to be brought to Cobalt mills for treatment.

It is expected that the Mining Corporation will shortly let a contract for sinking on the properties it has under option in the Gillies Limit. Some encouraging results have been encountered close to the surface, but to properly prospect the area it is necessary to sink approximately to the contact, which is about 400 feet deep.

Good progress is being made in the development of the Lorrain Consolidated. A crosscut is being run from the 260-foot level, which is expected to cut some of the veins within the next couple of weeks. One of these veins produced a small quantity of silver on the Belle Ellen property in the early days of the camp.

Cobalt. — The September report of the Nipissing states that during the month the company mined ore of an estimated net value of $172,000 and shipped bullion of an estimated net value of $130,000. The low-grade mill treated 6,858 tons, and the high-grade plant 131 tons. A total of 201,210 fine ounces of bullion was shipped from the refinery. A new vein was found on the 107-foot level of No. 26 shaft, which showed, in places, one inch of high-grade ore.

Kirkland.—Directors of the Lebel Lode Limited have been summoned to appear in the Cobalt Police Court to answer charges made by the Provincial authorities that the directors issued a prospectus which did not contain the information required by the law. The directors of the company claim that the prospectus itself contained all the necessary information, and would be sent to purchasers of shares, but that the company issued an advertisement offering to sell 100,000 shares, which did not contain all the statutory information required by the law. The directors claim that to do this would have required more money than they were able to spend. In a published advertisement one of the directors claims that the present Minister of Mines was a director in a company which advertised the sale of stock about a year ago, and apparently implies that in this company, as well, the law was not fully lived up to.

On the 600-foot level of the Lake Shore a length of approximately 2,000 feet in ore has been developed. The values on this level are reported to be higher than on the 400-foot level and are also more continuous. One stope, which has a length of about 350 feet, is stated to average $75 a ton and if this is so it is the richest stope in any of the gold mines of the Province.

The Highland-Kirkland is being unwatered and will again be worked. There is a shaft on the property 100 feet deep from which some drifting has been done, and these workings will be extended.

It is understood that satisfactory progress is being made in the re-financing of the Bidgood, and that if the present plans are carried out there will be sufficient money to complete the programme of exploration considered necessary.

The Tough-Oakes has started sinking the main shaft from 800 feet to 1,000 feet and two new levels will be opened. The more recent development on the property appear to have been most important, and it is stated that an ore-shoot 350 feet long, which carries values of $20, a ton over a width of 8 feet, has been opened up.

Porcupine.—Diamond drilling has been started on the Success property in Porcupine, which adjoins the Vipond. The property is operated by the Gold Acre Mines, a New York company.

Preparations are being made to continue the development of the Ankerite by English interests. The property was under option to the Coniagas some years ago, and the latter company did a large amount of work, but did not take up its option.

Five diamond-drill holes have been put down on the Martin property, which lies to the southwest of the Dome, and one hole is reported to have given an assay of $55 across 13 feet. Officials report that this drilling has indicated 100,000 tons of ore; but experience in Porcupine proves that diamond-drilling is not a safe guide for the estimating of tonnages. No underground work has yet been done on the property.

Thompson-Krist Company has issued a writ for damages against the Porcupine Crown Mines Limited. The action arises out of the operation of the old North Crown Mines, which was formed to take over and operate the properties of both companies. The Thompson-Krist was unable to provide its share of the funds, and bonds to the extent of $100,000 were foreclosed by

the Porcupine Crown. The latter company has recently removed the pumps and machinery from the mine, which is being allowed to fill with water.

The development of the Edwards lot is to be undertaken by English interests, who are arranging to purchase a mining plant to carry developments to a depth of 600 feet. The property consists of forty acres, on which there is a surface vein carrying low values. A shaft has been sunk to a depth of 50 feet. The property was diamond-drilled a few years ago by the Nipissing.

ALBERTA

Conciliation Board Presents Finding. — A decision of interest to the coal mine operators and coal miners of the Province of Alberta has been handed down by James Smith, Chairman of the Conciliation Board appointed to consider the evidence and render judgment on a dispute between the operators and miners of the Luscar Collieries, Alberta. Mr. Smith says:

"Under the agreement in effect between the United Mine Workers of America, District No. 18, and the Western Canada Coal Operators' Association, provision is made whereby in case of certain local disputes on which agreement cannot be reached, the Minister of Labour shall be called upon to appoint an independent or neutral chairman for the purpose of hearing case and rendering a decision thereon. For that purpose I have been appointed chairman by the Minister of Labour in the dispute at Luscar Collieries.

"On the 28th of September, 1923, the parties representing the United Mine Workers of America, District No. 18, and the Western Canada Coal Operators' Association, met in Edmonton and presented their case before me. The matter in dispute was in reference to payments made for coal taken from pitch pillars and entry or flat pillars, the coal in the former being conveyed to the car by means of chutes, while in the latter the coal will not run into the car under normal conditions and must be shovelled. The operators offered to pay 70c a ton for coal taken from pitch pillars and entry pillars, the same price for each, the representative of the miners asking 85c a ton for pitch pillar work and $1.05 a ton for entry or flat pillar work.

"I heard the evidence submitted and examined the documents, including the general agreement between the Western Canada Coal Operators' Association and the United Mine Workers of America, District No. 18, and I heard the arguments of both parties. The clause in the agreement admitted by both parties as applicable to the present dispute is as follows: 'In making the prices for new work the company shall be guided by existing prices in the same mine or other mines in the neighbourhood.'

"It was agreed by the parties that the price of pitch pillars at the Cadomin mine, a mine in the same neighbourhood and where conditions were similar to those at the Luscar Collieries, was applicable. That price at the Cadomin Mine is 70c per ton of 2,240 lbs., and I find that this price should govern pitch pillar work at Luscar Collieries.

"For entry or flat pillar work the representative of the miners finally asked for an addition of 20c for shovelling the coal over the amount of 70c for pitch pillar work, which would make flat pillar work 90c per ton, the operators adhering to their original offer of 70c per ton, the same as for pitch pillar work, alleging certain compensatory advantages in the mining which they claimed offset shovelling.

"To substantiate the men's claim I have been referred by Mr. R. Livett, representing the miners, to allowances made for shovelling coal in the Hillcrest mine, and in the Bellevue mine, and while these mines are not in the same neighbourhood as the Luscar, I have examined their rates and have given Mr. Livett's argument consideration.

"In the Hillcrest mine an allowance of 25c. per ton is made for loading into small cars. The mining rate, except for pillar work, is 76c per ton, and for pillar work is 61c per ton, being a difference of 15c per ton, which must be considered the advantage derived from pillar work mining. The mining and loading combined in pillar work is 86c. per ton, while the mining, without shovelling outside of pillar work, is 76c. per ton, making a difference of 10c per ton for shovelling, with the advantage claimed from pillar work mining.

"In the Bellevue mine the rate for loading, pushing, etc., coal which is mined from the crosscuts from up the pitch is 36c. per cubic yard. From this allowances for pushing and compensatory advantages of pillar mining should be deducted.

"Mr. Livett also put in evidence that at the Mountain Park, a mine in the same neighbourhood as the Luscar, by an agreement with the general manager, 20c a ton is allowed for shovelling. On reference to Mountain Park agreement, mining from pillars is given as 77c. per ton, while outside of pillars it is 85c. per ton, making 8c. a ton an advantage for pillar mining, which would leave 12c. a ton for shovelling.

"I have examined the rates of the Mountain Park and the other mines mentioned by Mr. Livett, and in all of them pillar work mining has certain compensatory advantages offsetting to a considerable degree the rate for shovelling outside of pillar work, this advantage running from 8c to 15c. a ton.

"The operators in support of their claim put in evidence that in the Diamond coal mine at Brule, a mine in the same neighbourhood, 8c. more per ton was allowed for mining for entry or flat pillar work than for pitch pillar work. It was admitted that no pillar work was done at Mountain Park Collieries, but that the rate of 20c. for shovelling coal was mutually agreed on and accepted by the parties as an order in full force, but it was claimed by the operators that advantages in pillar work existed in Luscar which did not exist in Mountain Park, and this offset to a great degree the price paid in Mountain Park paid for shovelling coal.

"It was admitted in evidence that approximately 50 per cent. of the coal in the entry pillars of Luscar Collieries would require very little actual mining and from this it was argued that the miner was to a great extent compensated for the shovelling required.

"Taking into consideration the evidence, the documents that were put in, the arguments presented to me, and the regard for the compensatory advantages from pillar mining, I am of the opinion that an equitable and fair allowance for entry or flat pillar work would be an increase of 10c. a ton, making in all 80c. per ton of 2,240 lbs. for entry or flat pillar work, and this is my finding.

"It was intimated by the operators that in certain parts of the flat pillar work chutes would be put in similar to those in pitch pillar work, thus eliminating

shovelling. If this is done so that shovelling is unnecessary, the increase of 10c. a ton for shovelling would not apply to entry or flat pillar work.

"I was greatly impressed with the earnestness, reasonableness and conciseness with which both parties presented their view, and the pains they took to make the dispute clear was of valuable assistance to me in making my finding."

BRITISH COLUMBIA

Dr. Schofield in Hong Kong. — Dean R. W. Brock, geologist, of the University of British Columbia, after attending the Pan-Pacific Scientific Conference at Sydney, New South Wales, and making a tour of parts of the Orient, has returned to Vancouver. The British Government has placed Dean Brock in charge of geological survey work at Hong Kong, China, and he has made a rough reconnaissance. Dr. S. J. Schofield, also of the University of B. C., has left to continue the work in Hong Kong.

While in Australia Dean Brock was one of a party, made up largely of scientists from the United States, who visited the various States composing the Commonwealth. He says that all nations interested in the Pacific, with the exception of some South American lands, were represented at the Conference and that the next gathering of the kind will take place three years hence in Japan.

In giving his geological impressions of the islands of the Pacific, Dean Brock, said, with reference to the Fiji Islands, that without doubt they belonged to the continental group.

Lardeau Operator Dies. — Wm. F. Cochrane, known as the "King of the Lardeau," a mining division lying in the Kootenays to the south of Revelstoke, died recently in Vancouver. He was the younger son of the Senator Cochrane, of Hillhurst, Quebec, and going to the Lardeau in 1900 lived there, an active mining operator, until 1914. He was associated with W. B. Poole, now of the Reno Mine, and C. S. Young, of Calgary, in forming the Great Northern Mines Ltd., which operated a number of mines in the Lardeau, including the Lucky Jack at Popular.

Rossland. — Free gold is reported to have been struck on the "O.K.", adjoining the I. X. L., and it is said that the ore-body is sufficiently well defined to give promise of persistence. With regard to the high values now being secured from the ores of these Rossland properties, it is interesting to note that the Department of Mines has had to pay $20 for a small though striking sample of the mineral for display at the forthcoming British Empire Exhibition.

New Placer Field Reported. — Reports are reaching the Pacific Coast of a new placer gold strike in the Kalem Lake region which is in northern British Columbia off the Grand Trunk Pacific Railway. Promising claims are said to have been staked at the head of Kalem Lake in the Rosswood District, about 28 miles from Terrace on the G. T. P. Prospectors have been quietly leaving Smithers and neighboring towns en route to the district.

Market for B. C. Coke. — The British Columbia Products Bureau of the Vancouver Board of Trade has become interested in the statement of a correspondent, William J. Auw, of South Pasadena, California, that there is a market in that State for coke of a good blast-furnace quality. Mr. Auw expressed the view that there should be a good market for such coke delivered at Los Angeles harbor. As United States coke enters British Columbia free of duty, the same material exported from Canada would receive the same treatment in crossing the line. Mr. Auw's representations will be laid before provincial producers of coke.

Alaskan Gold Mining. — From Fairbanks, Alaska, comes the statement that the gold output of that territory this year will be exceptionally high. It is likely to be double that of last year according to some operators. On Caribou Creek there has been much activity and the first clean-up on the Airship Mine was larger than was expected. The construction of the new depot at Fairbanks, the initiation of work on terminals, and general industrial progress, has brought prosperity and confidence to the territory. It is reported that important copper deposits have been located in the Kashwitna section, 40 miles from the Alaska railroad in the interior, and a pack trail to the district has been opened.

Salmo. — Harold Lakes, of the Nugget Gold Mines, Salmo, reports that his Company is exploring thoroughly the possibilities of the Golden Bell Mine, adjacent to the Nugget.

Kaslo. — British interests represented by Mayor James Anderson, of Kaslo, are expected to re-open the Jackson Mines, which include the Northern Belle, Kootenay Star, Labor Day, Ophir, Congress and Dublin Queen, all early locations. The property is equipped with a concentrator and tramway and has shipped approximately 4,000 tons of high-grade silver-lead concentrate. It has been idle for some fifteen years. R. H. Stewart, formerly general manager of the Consolidated Mining and Smelting Co., is mentioned as likely to be the consulting engineer of the company. Important showings, it is said, have been found on the Dublin Queen as a result of development work Mr. Stewart has been directing.

The moving of the Kaslo mill to the Stemwinder Mine near Kimberley is contemplated by M. S. Davys who proposes adapting the plant, with some additions, to the treatment of the ore of the latter property.

The Gibson Mine is to be further developed by the Daybreak Mining Co., which succeeds the Gibson Mining Co. J. C. Roberts, president of the former Co., and Robert Gunning, of Portland, Ore., a large shareholder, recently visited the property. A contract is being let for the driving of 1,000 feet of tunnel and bunk houses are being built for the housing of the workmen.

Sandon. — The finding of a large body of ore on the Ruth, Sandon, has led to the belief that the continuation of the lead of the Silversmith Mine has been located.

Stewart. — The American Mining & Milling Co., is reported to have had a favorable report from their consulting engineer, Andrew Larsen, with respect to the results of development work on their properties on Fish Creek and in other parts of the Portland Canal district. Grant Mahood has resigned as president of the Company and is being succeeded by Major W. G. Swan. The International Financiers Ltd., a new Company, has been formed by Mr. Mahood and is said to have unwritten the entire treasury stock of the parent Company. The American Mining and Milling Co. has options on some Georgia River properties, Portland Canal, and is acquiring control of others in that locality.

Alice Arm. — The affairs of the Dolly Varden Mine appear to have been put in satisfactory shape following the foreclosure proceedings initiated by the mortgagee, George Wingfield, and his associates. The holdings first were turned over to the Northern Mining Properties Ltd., in which Mr. Wingfield was a large stockholder. Then the Dolly Varden Properties Ltd., was organized, to which the mine and plant have been transferred, and this Company holds the railway under a 999 year lease. It was reported recently that the Dolly Varden had been sold but there is no official confirmation of this, although it is expected that definite action will be taken before long in regard to the further development of the claims known as the Dolly Varden group.

Trail Ore Receipts. — Ore receipts at the Trail smelter, Consolidated Mining & Smelting Co., for the last nine days of September totalled 4,947 tons, made up as follows:

	Tons
Alamo, Alamo	55
Eholt Mining Co., Eholt	3
Granite, Taghum	8
Knob Hill, Republic Wn.	174
Lone Pine-Surprise-Last Chance, Republic, Wn.	314
Quilp, Republic Wn.	194
Silversmith, Sandon	140
Sally, Beaverdell	34
Van Roi, Sandon	28
Company Mines	4,029
Total	4,979

During the first months of the year the weekly receipts averaged 9,000 tons. In the past six weeks they have dropped to about 4,500 tons, which is explained by the fact that the product of the Big Sullivan Mine now is reaching Trail as concentrates as a result of the opening of the Kimberley mill.

September Coal Production. — British Columbia's coal production for the month of September totalled 181,634 tons, a drop as compared with the previous month of 40,662 tons.

Of the total output for the month the Vancouver Island mines were responsible for 121,880 tons, approximately 67.1 per cent of the total, which is 14,067 tons under the production of August.

The Nicola-Princeton mines produced 18,978 tons, a decrease of 2,613 tons in comparison with the output for August, and about 10.4 per cent. of the total production.

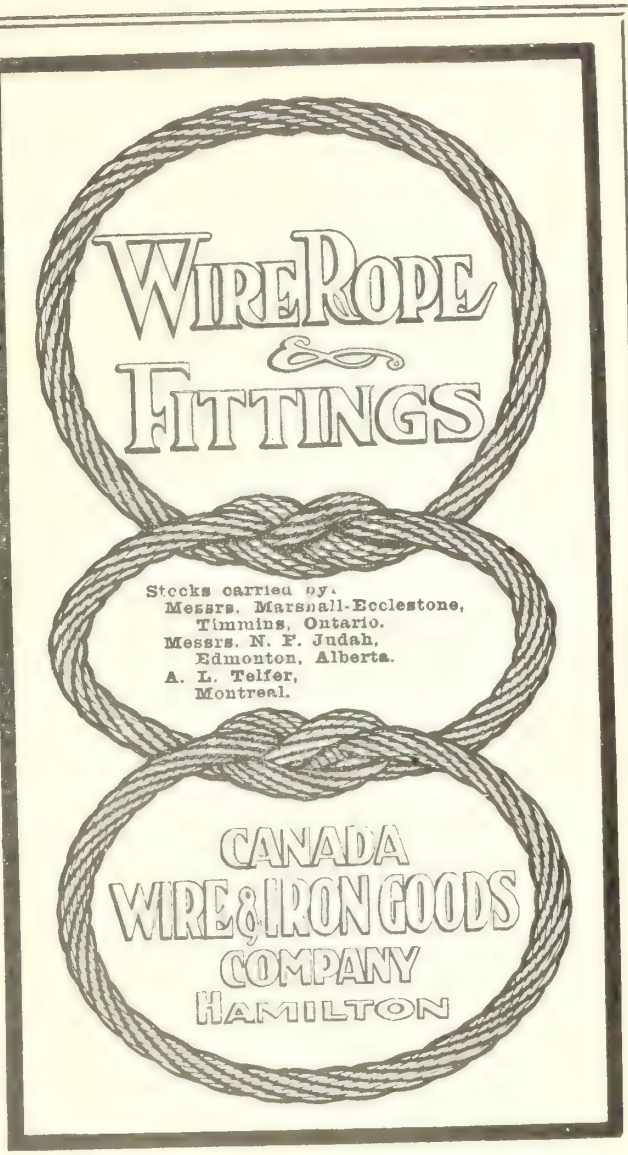
The Mines of the Crow's Nest Pass district produced 40,776 tons, which is 23,982 tons under the August figure and some 22.5 per cent. of the total for the province.

All the Vancouver Island mines show a decline with the exception of the Canadian Collieries (D) Ltd., Comox Mine, which has an increase in comparison with August of 689 tons, and Messrs. King and Foster, Old Wellington Mine, which shows an increase of 7 tons.

The Nicola-Princeton collieries all have dropped in output.

In the Crow's Nest Pass the Corbin Colliery alone shows an increase. Its output is 739 tons better than it was in August. The other collieries, however, have dropped materially.

It is expected the iron ore shipments from the Lake Superior region will reach 60,000,000 tons during the present season. Last year the total was 12,000,000 tons.



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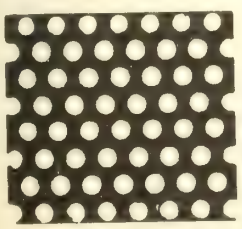
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Holman Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
John J. Garthshore.
Peacock Brothers, Limited.
Powley & Moody, Limited.
The William Kennedy & Sons, Ltd.

Cast Steel Gears:
Canada Foundries, Ltd.
The William Kennedy & Sons, Ltd

Castings (Iron and Steel):
Herbert, Alfred, Limited.
Holman, Bros., Ltd.
Peacock Brothers, Limited.
The William Kennedy & Sons, Ltd.

Cement Machinery:
Hadfields, Limited.
Hull Iron & Steel Foundries, Ltd.
The William Kennedy & Sons, Ltd.

Chains:
Dodge Manufacturing Co.
Jones & Glassco, Reg.
Canadian Link-Belt Co., Ltd.
Greening, B. Wire Co., Ltd.
Powley & Moody, Limited.

Chain Drives:
Jones & Glassco (Regd).
Powley & Moody, Limited.

Chain Drives — Silent & Steel Roller:
Link-Belt Limited.
Hans Renold of Can., Ltd.
Jones & Glassco (Regd.).

Chemist:
Thos. Heyes & Sons.
Milton Hersey Co.
Ledoux & Co.

Classifiers:
The Dorr Company.

Clutches:
Link-Belt Limited.
Hans Renold of Can., Ltd.

Coal:
Dominion Coal Co.
Nova Scotia Steel & Coal Co.

Coal Cutters — Coal Pick Machines:
Sullivan Machinery Co.
Canadian Ingersoll-Rand Co., Ltd.
Hebert, Alfred, Limited.
Holman Bros., Ltd.
Peacock Brothers. Limited.

Coal Crushers & Conveyors:
Link-Belt Limited.
Peacock Brothers, Limited.

Coal Mining Machinery:
Canadian Ingersoll-Rand Co., Ltd
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co. Ltd
Hadfields, Limited.
Hendrick Mfg. Co.
Hebert, Alfred, Limited.
Holman Bros. Ltd
Powley & Moody, Limited.
Sullivan Machinery Co.

Coal Screening Plants:
Link-Belt Limited.
Canadian Mead-Morrison Co.

Cobalt Oxide:
Deloro Smelting & Refining Co., Ltd.

Compressors — Air:
Belliss & Morcom, Ltd.
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Denver Rock Drill Mfg. Co.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Laurie & Lamb.
Smart-Turner Machine Co.
Peacock Brothers, Limited.

Concentrating Tables:
Herbert, Alfred, Limited.
Holman Bros., Ltd.
The Mine & Smelter Supply Co.

Concrete Mixers:
Canadian Fairbanks-Morse Co., Ltd.
Gould, Shapely & Muir Co., Ltd.

Condensers:
Canadian Ingersoll-Rand Co. Ltd.
Belliss & Morcom, Ltd.
Laurie & Lamb.
Peacock Brothers, Ltd.

Condensers — Electrical Static & Power:
Griswold & Co.

Consulters and Engineers:
Milton Hersey Co., Ltd.

Conveyors:
Link-Belt Limited.
Canadian Mead-Morrison Co.
Jones & Glassco (Regd.).

Conveyor Belts:
Canadian Fairbanks-Morse Co., Ltd.
Gutta Percha and Rubber, Ltd

Conveyor Flights:
Hendrick Manufacturing Co.

Conveyor — Trough — Belt:
Dodge Manufacturing Co.
Link-Belt Limited.
Hendrick Mfg. Co.
Jones & Glassco, Regd.

Copper:—
Consolidated Mining & Smelting Co.

Countershaft Fixtures:
Dodge Manufacturing Co.

Couplings:
Dodge Manufacturing Co.
Hans Renold of Can., Ltd.

Cranes:
Link-Belt Limited.
Canadian Mead-Morrison Co.
Peacock Brothers, Limited.

Crane Ropes:
Allan Whyte & Co.
Canada Wire & Cable Co.
Greening B., Wire Co., Ltd.

Crucibles:
The Mine & Smelter Supply Co.

Crusher Balls:
Canada Foundries & Forgings, Ltd.
Herbert, Alfred, Limited.
Holman, Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
Peacock Brothers, Limited.
The William Kennedy & Sons, Ltd.

Crusher Jaws:
Canadian Steel Foundries, Ltd.
The William Kennedy & Sons, Ltd.

Crushing Rolls:
Canadian Steel Foundries, Ltd.
The William Kennedy & Sons, Ltd.

Crushers — Jaw & Gyratory:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
Lymans, Limited.
The Mine & Smelter Supply Co.
Hadfields, Limited.

Cut Gears:
Hans Renold of Can., Ltd.
Jones & Glassco, Regd.
The William Kennedy & Sons, Ltd.

Cyanide:

Cyanide Plant Equipment:
The Dorr Co.
The Mine & Smelter Supply Co.

Diamond Drill Contractors:
Smith & Travers
Sullivan Machinery Co.

Diesel Engines:
Belliss & Morcom, Ltd.
Canadian Fairbanks-Morse Co., Ltd.
Laurie & Lamb.
Lammers & Maase, Ltd.

Dies:
Canada Foundries & Forgings, Ltd
Herbert, Alfred, Limited.
Hull Iron & Steel Foundries, Ltd.
Holman Bros., Ltd.

Dredging Ropes:
Allan Whyte & Co.
Greening, B. Wire Co., Ltd.

Dredges:
Canadian Mead-Morrison Co.

Dredger Pins:
Hull Iron & Steel Foundries, Ltd.

Dredging Machinery:
Hadfields, Limited.
Hull Iron & Steel Foundries, Ltd.

Drills — Air and Hammer:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Herbert, Alfred, Ltd.
Holman Bros., Ltd.
Sullivan Machinery Co.
The Mine & Smelter Supply Co.

Drills — Core:
Canadian Ingersoll-Rand Co., Ltd
Herbert, Alfred, Limited
Holman Bros., Ltd.
Sullivan Machineery Co.

Drill Steel Furnaces:
Canadian Ingersoll-Rand Co., Ltd.
Denver Rock Drill Mfg. Co.
Herbert, Alfred, Limited
Holman Bros., Ltd.
Sullivan Machinery Co.

Drills — Diamond:
Sullivan Machinery Co.

Drill Steel — Mining:
Canadian Ingersoll-Rand Co., Ltd..
Hadfields, Limited
Mussens, Limited

Drill Steel Sharpeners:
Canadian Ingersoll-Rand Co., Ltd.

Drills — Electric:
Canadian Fairbanks-Morse Co., Ltd
Herbert, Alfred, Limited
Holman Bros. Ltd.
Sullivan Machinery Co.
Northern Electric Co., Ltd.

Drills — High Speed and Carbon:
Canadian Fairbanks-Morse Co., Ltd.
Hadfields, Limited
Herbert, Alfred, Limited
Holman Bros, Ltd.

Ejectors:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd.

Electric Condensers:
Griswold & Co.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Herbert, Alfred, Limited
Holman Bros., Limited
Northern Canada Supply Co.

Electric Hoists:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Mead-Morrison Co.

Elevators:
Dodge Manufacturing Co.
Canadian Machinery Co.
Sullivan Machinery Co.
Link-Belt Limited.
Northern Canada Supply Co.
Hadfields, Limited.
Jones & Glassco (Regd.).

Engineering & Surveying Instruments:
Laurie & Lamb.

Engines — Ventilating:
Canadian Sirocco Co., Ltd.

Engines, Diesel:
Canadian Fairbanks-Morse Co., Ltd.
Bellis & Morcom Ltd.
Laurie & Lamb
Lammers & Maase, Ltd.

Engines — Gas and Gasoline:
Canadian Fairbanks-Morse Co., Ltd.
Belliss & Morcom, Ltd.
Sullivan Machinery Co.
Gould, Shapely & Muir Co., Ltd.
Laurie & Lamb.
The Mine & Smelter Supply Co.
Powley & Moody, Limited.

Engines — Haulage:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd.
Powley & Moody, Limited.

Engines — Steam:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Laurie & Lamb

Engineers:
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Dorr Co.
Ferrier, W. F.
Hore, R. E.
Heves & Sons, Thos.
Hersey Co. Ltd., Milton
McEvoy, James C.
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Canadian Steel Foundries, Ltd.

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Northern Electric Co., Ltd.

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Hercules Powder Co.

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Canadian Ingersoll-Rand Co., Ltd.
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The Hamilton Gear & Machine Co.
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Goldsmith Bros.

Gold Pans:
Can. Chi. Bridge & Iron Works, Ltd.
Horton Steel Works, Ltd.

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Canadian Mead-Morrison Co.

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Dodge Manufacturing Co.

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Consolidated Mining & Smelting Co
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Cranes:
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Greening, B. Wire Co.
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Screens — Perforated Metal:
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Screens — Revolving:
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Pacific Coast Pipe Co.

Tanks — Steel:
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Hendrick Mfg. Co.
The William Kennedy & Sons, Ltd.

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Hendrick Manufacturing Co.

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Hendrick Manufacturing Co.
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Holman Bros., Ltd.
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Mine & Smelter Supply.

Tube Mill Balls:
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Herbert, Alfred, Limited.
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The William Kennedy & Sons, Ltd.

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The William Kennedy & Sons, Ltd.

Turbines:
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Laurie & Lamb.
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Hull Iron & Steel Foundries, Ltd.
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Canadian Ingersoll-Rand Co., Ltd.
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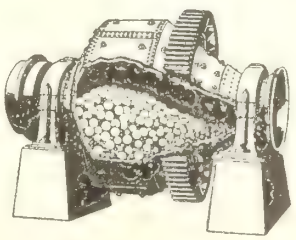

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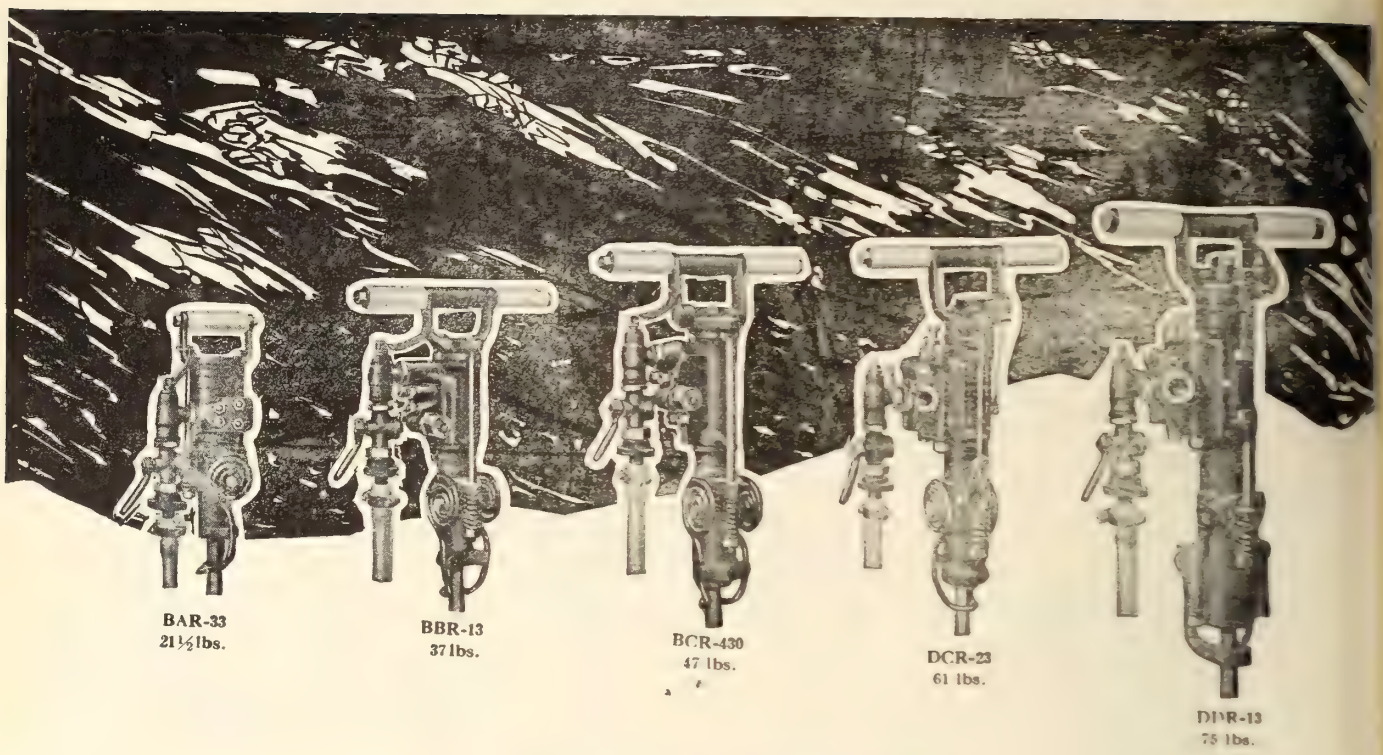

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PROVINCE OF ONTARIO

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Mineral Areas

Ontario, with its 407,262 square miles, contains many millions of acres in which the geological formations are favourable for the occurrence of minerals 70 per cent of the area being underlain by rocks of pre-Cambrian age. The phenomenally rich silver veins of Cobalt, Gowganda and South Lorrain occur in these rocks; so also do the far-famed nickel-copper deposits of Sudbury, the gold of Porcupine and Kirkland Lake, and the iron ore of Magpie and Moose Mountain mines.

Economic Minerals

In addition to the above, practically all economic minerals (coal and tin excepted) are found in Ontario: — actinolite, apatite, arsenic, asbestos, cobalt, corundum, feldspar, fluorspar, graphite, gypsum, iron pyrites, lead, mica, molybdenite, natural gas, palladium, petroleum, platinum, quartz, salt, talc and zinc. This Province has the largest deposits on the continent of talc, feldspar, mica and graphite.

Building materials, such as ornamental marble, limestone, sandstone, granite, trap, sand and gravel, lime, Portland cement, brick and tile, meet every demand.

Mineral Production

Preliminary returns show the output of the mines and metallurgical works of the Province for the year 1922 to be worth $62,202,169, of which the metallic production was $38,190,711.

The following figures show the growth of Ontario's mineral industry by five-year periods since 1891 when a Bureau of Mines was first established.

Year.	Value.	Year.	Value
1891	$4,705,672	1911	$41,976,797
1896	5,235,003	1916	65,303,822
1901	11,831,086	1918 (Maximum war output)	80,308,972
1906	22,388,383	1921	48,128,387
	Dividends.		

Dividends and bonuses paid to the end of 1922 amounted to $28,096,699 for gold mining companies, and $86,238,185 for silver mining companies or a total of $114,334,884.

Mining Regulations

A miner's license costs $5.00 per annum, and entitles the holder to stake out in any or every mining division three claims of 40 acres each. After performing 200 days' assessment work on a claim, patent may be obtained from the Crown on payment of $2.50 or $3.00 per acre, depending on location in unsurveyed or surveyed territory.

Assay Office

The Provincial Assays Office at No. 5 Queen's Park, Toronto, is maintained by the Department of Mines for the free identification of minerals, free assays under the provisions of the Mining Act of Ontario, and also for general assay work as per the Schedule of Charges which may be obtained on application.

Temiskaming Testing Laboratories

The Department maintains, at Cobalt, an ore sampling and testing laboratory which is now prepared to receive parcels of gold ore from 100 pounds upward, and after sampling and assaying the same to pay to the shipper the value thereof, less treatment charges. The purpose is to afford a market for ores extracted by prospectors and others in developing their mining claims, enabling them to obtain funds which they can use for further work and to report on the most satisfactory method of treatment. Fuller information may be obtained on application to the Manager, Temiskaming Testing Laboratories, Cobalt, Ontario.

Publications

For list of publications, illustrated reports, geological maps and mining laws, apply to

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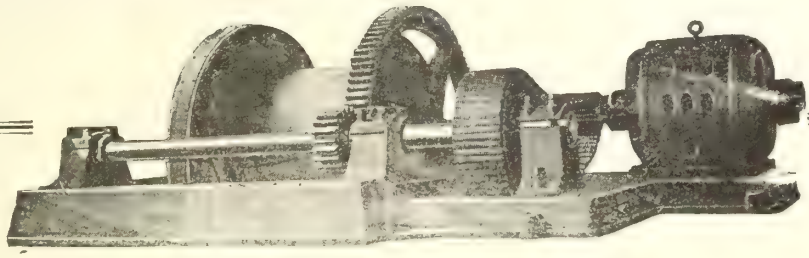

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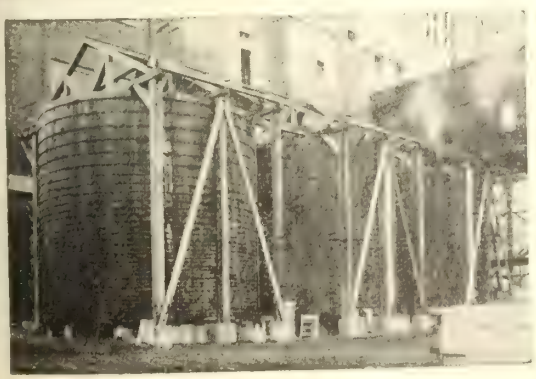

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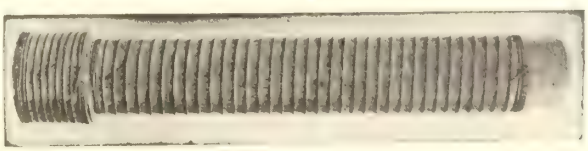

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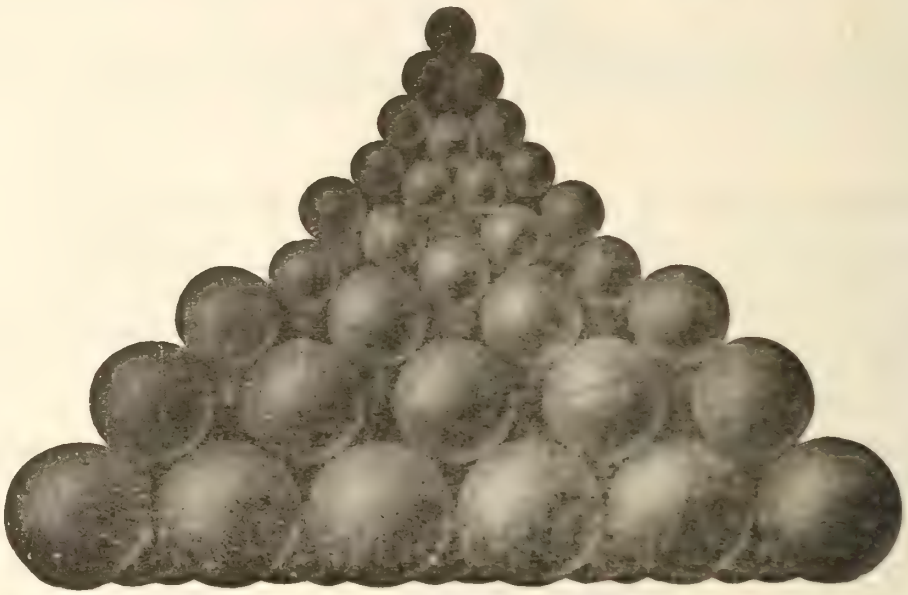

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CANADIAN MINING JOURNAL

PUBLISHED WEEKLY

Devoted to the Science and Practice of Mining, Metallurgy and the Allied Industries; and more particularly to their progress in Canada

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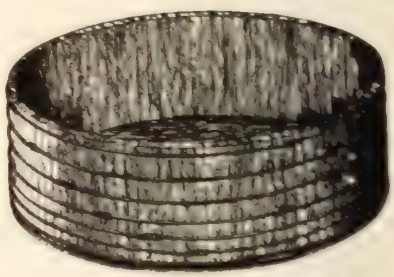

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:-: EDITORIAL :-:

OVERSEAS PARTNERSHIPS REQUIRED

The Prime Minister of Canada has repeated his request to the British public for men and money to assist in settling our land, developing our natural resources and expanding our manufacturing activities. This was the substance of his first address on landing in England, and now, towards the end of his visit, he repeats it. The topic is certainly of sufficient importance to warrant repetition again and again; but we are rather fearful that the impression will spread abroad in Great Britain that Canada's attitude to the mother country is that of a child to its parent, rather than that of the full-grown daughter, who is in charge of her own house and wishes merely the coöperation and mutual support that is the essence of natural family relations, where grown-ups are concerned.

Let us take the case of mineral resources. It has been demonstrated conclusively that long-distance investment in Canadian mines, without adequate personal contact, is almost bound to end in disaster. Commencing with Rossland over quarter of a century ago, there has been a series of failures resulting from the direct control from London of mining enterprises in this country. The few exceptions serve but to accentuate the difficulties that attend long-distance management. Today we see exemplified a much sounder and more successful type of overseas investment. British and Canadian capital is joined in mining ventures, and its expenditure is being directed by men, most of them natives of this country, thoroughly familiar with our conditions and competent to make the most of the money entrusted to their care. There are numerous examples of these Anglo-Canadian companies, and, fortunately, their number is increasing rapidly.

We should like, therefore, to couple with Mr. MacKenzie King's request for British capital a statement, on behalf of our mineral industry, that it is a partnership arrangement that we wish to have. It is from the mutual responsibilities of a partnership that both we and they will get the best result. We have now an adequate corps of technically proficient mining men to direct the whole of our industry. We have likewise various groups of well-tried mining investors thoroughly equipped to expend their funds judiciously and profitably. These engineers and investors are better fitted to handle mining development and operation in this country than are outsiders without their intimate knowledge of Canadian conditions. We can make good use of British capital in finding and developing new mines; but it will be most wisely expended under the direction of an Anglo-Canadian partnership.

AN IMPERIAL DELEGATE

On Monday of this week mining men in Vancouver welcomed to Canada a representative of the mining men of Great Britain in the person of Mr. Hugh F. Marriott, Past-President of the Institution of Mining and Metallurgy. Mr. Marriott has been delegated by this institution and the Institute of Mining and Metallurgical Engineers to make a tour of the Empire on behalf of the forthcoming Empire Mining and Metallurgical Congress, to be held at the British Empire Exhibition in June, 1924. He comes directly from Australia and New Zealand, where he has interviewed the members of the mining and metallurgical societies on behalf of the Congress.

Mr. Marriott's object in visiting Canada is twofold. He wishes to inform us about the forthcoming Congress, its aims and its proposed activities, and he also wishes to gather at first hand information as to the views and inclinations of Canadian mining men. To this end an itinerary has been arranged for him by the Canadian Institute of Mining and Metallurgy that will give him an opportunity of conferring with the members of each of the Institute's branches, from British Columbia to Nova Scotia.

The objects of the proposed Empire Congress have been set forth in these pages before, but they will bear repetition on this occasion. The proposals involve a federation of the mining and metallurgical institutes of Great Britain, the Dominions and other parts of the Empire, the chief objects of which will be:

(a) To serve as an organ of intercommunication between the co-operating institutions and to promote the interests of the professions and industries.

(b) To create and maintain throughout the Empire a high standard of technical efficiency and professional conduct.

(c) To convene at regular intervals an Empire Mining and Metallurgical Congress.

Already the leading mining and metallurgical societies of Great Britain have subscribed to the idea, and it is hoped that, as a result of Mr. Marriott's visit, the names of the institutes in Canada and the other Dominions will be added to the list.

PROGRESS OF HURONIAN BELT COMPANY

Today we print an account of the annual meeting of the Huronian Belt Company, which is becoming rapidly an important factor in the exploration and development of mineral lands in eastern Canada. Particularly noticeable is the vigour and acumen with which the primary work of prospecting and the initial development of prospects has been conducted by the management. The operation best known to the public is the resuscitation of the two expiring mines, Keeley and Vipond, and their return to healthy and useful lives, which we expect will be long as well. The management of these is being conducted in a straightforward way, which augurs well for the status of new mines that may be added to this first pair. The Vipond operations are still, unfortunately, being carried on under the shadow of stock exchange operations that can bring it no credit; the Keeley suffers from no such incubus.

The success of the Huronian Belt Company up to the present is due primarily to a scientifically conducted course of investigation, based on geological grounds. The wonderful ore-shoots at the Keeley would still remain hidden had not Dr. Bell studied the ground, divined Nature's secret, and put his conclusion to the test. Similarly acute and sound was the reasoning that has directed the expenditure on the moribund Vipond property. In both these cases the investment required has not been of serious dimensions, as mining investment goes; the prime factor has been the human capacity for geological deduction and the decision to spend the money on geological advice. Not every venture will turn out so successfully as have Keeley and Vipond; but these two "hits" will cover amply the cost of many "misses."

It is in the newer camps that the Company's progress in the immediate future would seem to be centred. The annual report gives a list of holdings in a number of promising localities. A good deal of vigorous work has been done already on these claims and on some of them intensive prospecting has disclosed showings of ore that warrant a considerable additional expenditure. We may, therefore, expect that the next annual report of the company will record, not only further progress in the two established mines, but an addition to their number.

PEAT SUPPLY ASSURED FOR 1924

Some time ago we referred in these columns to the order-in-council at Ottawa that authorized the Department of Mines to turn over the peat plant at Alfred, Ontario, to private interests, provided the applicant gave evidence of his good faith and of his ability to finance the operation of the plant. The Ontario government concurred in this arrangement, and it remained only to find a man ready to undertake the venture. Such a man has not been easy to locate peat has a bad name in Canada, due to former unsuccessful attempts to use it.

Now the man has been found. His credentials have been examined by representatives of the government at Ottawa and Toronto and have been found to be thoroughly satisfactory. He is already involved in fuel supply on a large scale, and has bought and distributed a considerable fraction of the peat made at Alfred during the experimental operations. He is familiar in detail with the plant and its operation, as well as with the cost of its product. He is satisfied that the Anrep-Moore peat plant is capable of making good fuel at a profit, and has backed this belief with his money. The government now holds his bond for a large sum, and he owns the plant at Alfred, subject to the conditions of the bond, chief of which is the stipulation that the plant shall be operated next summer.

The present owner of the peat plant is not able alone, to finance the operation of the peat plant next summer. He intends, therefore, to ask for the cooperation of others interested in the commercial establishment of a peat industry. A company with a modest capitalization is in process of incorporation and the stock will be offered for public subscription. The technical authorities of both governments, possessed of full information, have already recommended the project to the public for investment. There is no doubt that the public will respond.

TRAIL MEETING OF THE INSTITUTE

Trail is the seat of Canada's largest group of metallurgical plants. Its products are diversified and some of the processes used are unique. At the meeting of the British Columbia Division of the Institute at Trail two weeks ago the visitors were shown through the plants, and their operation was explained. Much of the information divulged on this occasion is now made public for the first time. It will add largely to the creditable record of Canadian metallurgists. The same can be said of the smelting process at Anyox and of the new concentrating plants at Kimberley and Britannia, which were also discussed at the meeting.

The proceedings of this branch meeting of the Institute, reduced to the printed page, will serve well to illustrate the performance of one of its chief functions. The annual volume of Transactions is the repository of mining and metallurgical information, both technical and historical, and it is worth the best efforts of those engaged in the active pursuit of the sister sciences to add their quota to the record as occasion offers. For generations to come these volumes will be consulted by our successors. We are confident the record will be well worthy of this present generation of miners and metallurgists.

Institute Meeting at Trail

Papers on Sullivan and Rossland Mines, the Smelters, Refineries and Concentrators, and Prospecting. Visit to Rossland Mines.

The annual meeting of the British Columbia Division of the Canadian Institute of Mining and Metallurgy, was held at Trail, B. C. October 17th to 20th, and has proved to be an event of great importance in the annals of the Institute. The local committee, with the whole-hearted support of the staff of the Consolidated Mining & Smelting Co., made excellent arrangements for the meeting, and both the local members and the delegates from the Coast and other points agreed that the results were of the most important and encouraging nature.

The program of papers that had been arranged included description of operations at three of the most important mining centres of British Columbia, and these subjects were dealt with in a way that marked these contributions as of more than usual importance. The problems that have been faced and overcome, and the operations that are being carried out by the Consolidated Mining & Smelting Co., the Granby M. S. & P. Co., and the Britannia Mines were published for the first time, and aroused a high degree of interest. In addition to these papers Mr. Guernsey gave an account of the Sulphur industry and Mr. S. S. Fowler gave a fascinating account of the history of mining in the Kootenays.

Scientific Direction for Prospecting

In presenting Dr. W. L. Uglow's paper on "Undiscovered Mines in B. C.," Mr. H. G. Nichols said that the purpose of the paper was to note the passing of the days of mines with outcrops, and the consequent influence upon prospecting and investment. The reasons for believing that deposits exposed at the accidental surface form but a part of the orebodies of B. C. were discussed, and the handicaps to the prospector in his search for buried ore were outlined. The elimination of the attraction of quick returns also affects the attitude of capital towards prospecting. Long chances are becoming things of the past and the investor wants to be shown more and more why he should speculate in mining.

Methods for the assistance of prospecting in assuming the added burden entailed by these conditions were referred to, and among them particular reference was made to the researches in electrical prospecting. Most important of all is the aid that is to be found in the direction of prospecting by the application of geological reasoning. We engineers and geologists are not the only ones who are aware of the growing disability of the old-time methods to cope with present conditions. The investor is also fully aware of it, and attempts to conceal it, by ultra-optimistic representations of possibilities, only serve to reduce confidence. Our aim today should be to inspire confidence, and this may be done best by adopting methods that will commend themselves by serving to reduce the risks of prospecting.

A keen discussion was also initiated by Mr. C. M. Campbell's paper "Publicity in the Mining Interest."

The subject of the Iron and Steel industry was also discussed at a business meeting in Rossland on the 17th inst. The particular subjects of interest that were dealt with at this meeting will be referred to in detail next week.

Growth of Sullivan Mine

S. G. Blaylock, General Manager of the Company, told of the staking of the "Sullivan" over thirty years ago by Pat Sullivan and party, four claims being located which later became the "Sullivan Mine." Development was accelerated by the railway, which was constructed in 1898 and 1899. In 1900 a compressor was installed and the first shipments of silver-lead ore made. Over 300,000 tons of ore were developed and then a smelter was thought necessary. The work was started but was never completed. The mine had closed in 1907 and in that year it was leased by the Consolidated. The ore was tested, a sorting plant installed, and thereafter the Consolidated obtained full control. Development continued and production grew as follows: 1910, 23,000 tons; 1911, 24,700 tons; 1912, 28,650 tons; 1913, 31,000 tons; 1914, 36,000 tons; and 1915, 44,500 tons.

The workings of the "Sullivan Mine" were well described by W. M. Archibald, Manager of Mines, who referred to the recent installation of electric hoists and windlasses, of new compressors and larger gauge tracks, of modern accommodation provided for employees, and of the establishment of a hospital and a resident physician at Kimberley.

Concentrating and Smelting

Electrolytic smelting and the treatment of zinc ores were dealt with by B. A. Stimmel, while concentrating methods were spoken of by R. W. Diamond, superintendent of the Concentrating Department, and E. M. Styles, designer of the Kimberley Concentrator. The process of refining at Trail was the subject of an address by George Murray, assistant superintendent of the Consolidated.

Nichol Thompson, of Vancouver, who recently returned from England, predicted that there would be a flood of British capital for development of provincial minerals if the "prospectors would come down to earth." He had reference to valuations placed on prospects.

Texas Sulphur

The sulphur deposits of Texas were described with the assistance of illustrations by F. W. Guernsey and it was noted, as a matter of interest, that the directors of the industry were former residents of Trail. W. H. Aldridge, head of the enterprise, was general manager of the Trail Smelter for a number of years; R. H. Stewart, of Vancouver, another former general manager at Trail, was consulting engineer of the Texas industry; Charles Beisel, at one time resident in Trail, is the general manager. The Texas Plant supplies sulphur for the pulp manufactures of the Province.

Ninety Miles of Underground Workings

The Leroi Mine, Rossland, was visited under the guidance of Mr. Archibald and E. D. Peters, superintendent. Delegates were shown the 800 and 1,650-foot levels and were run for a mile underground by electric tram to West Leroi ground, where a gold-copper vein has been developed, 400 feet long and twenty feet wide. It was explained that the Rossland Mines have about ninety miles of underground workings and that, with the acquisition of the Leroi No. 2, the Consolidated now is operating all the developed mines of the camp. The mines have a maximum depth of 2,600 feet, being sunk to the level of the Columbia river at Trail, and with the completion of the Kimberley Smelter and the consequent relief of pressure at Trail work at Rossland is being stimulated, the force now totalling 225 men with more being added as the company's plans are put into effect.

Portland Canal Gold-Silver-Lead Mines

By ALEXANDER GRAY

The uniform courtesy that has characterized the conduct of Dr. H. A. Guess, Vice-President and Managing Director of the Premier Gold Mining Company and his readiness to co-operate with all who are constructively interested in those mineral developments in which he has played such a conspicuous part, make it possible to present up-to-date facts about British Columbia's chief precious metal producer. A glance at the topography, the heavy timber, and the towering peaks round about the Premier, Indian, B. C. Silver, Big Missouri, and other properties as indicated in the accompanying photograph, make it quite comprehensible why Portland Canal areas had to await the coming of influential capitalists. A region so remote and rugged, that Dr. Guess and his principals had to construct an aerial tramway to tidewater, a distance of eleven miles, has all the glamour of mining in the western ranges. Bunting and Bush and their contemporaries, therefore, and even the Clothiers, who staked the Indian properties; "Koolgardie" Smith, Leckie—all who acquired Portland Canal areas a decade and a half ago—after having made discoveries, were compelled to realize that mines so situated are slow assets when removed from the quickening influence of large capital and adequate technical skill.

Without the Premier Mine and its Guggenheim-Keith-Neill-Trites-Wood-Wilson-Untermeyer control, the Indian Mines might have remained a debatable prospect, the Big Missouri a perennial disappointment, the B. C. Silver Mines unexplored, and the neighboring areas now acquired by strong combinations would have continued to be a part of past history. Primarily Neill and his colleagues, who found the Premier, made Portland Canal a field for mining enterprises of magnitude. English, American and Canadian capitalists are now competing in friendly rivalry for what was condemned over and over again. Instead of being "property poor," those who held on to the ground, or who acquired it at distress prices, are being compensated for the years of hope deferred since 1911, when Bush could not interest anyone long enough in the Premier B. C. Silver and the Bush; the Lindeborgs could not let go of the Big Missouri, and Leckie was locked up with the Hercules. The Clothiers had more faith in the Indian than others would show with their money.

New Era with Big Milling Capacity

A 1,000-ton mill to treat the Premier lower-grade ores; probably a railway to serve the district; a mill of undetermined capacity for the Indian; reports that individual Premier directors who took over the Premier property from Bush have been fortunate with their Big Missouri venture; the acquisition of the Hercules by Toronto people; the tentative deal with the Forty-Nine on behalf of London principals; all certify to the substantial character of the Portland Canal movement, which so impressed Mr. Leopold Albu, Managing Director of the Albu General Mining & Finance Group of the Rand, that upon his return to London he stated publicly his optimistic view regarding the future of this British Columbia district. Therefore, what the Sullivan Mine and Trail metallurgy did for the Fort Steele mining division, what Granby operations provided at Anyox for the Naas district, what Howe Sound did for its secttion,—this the Premier company has accomplished for the Portland Canal Mining division.

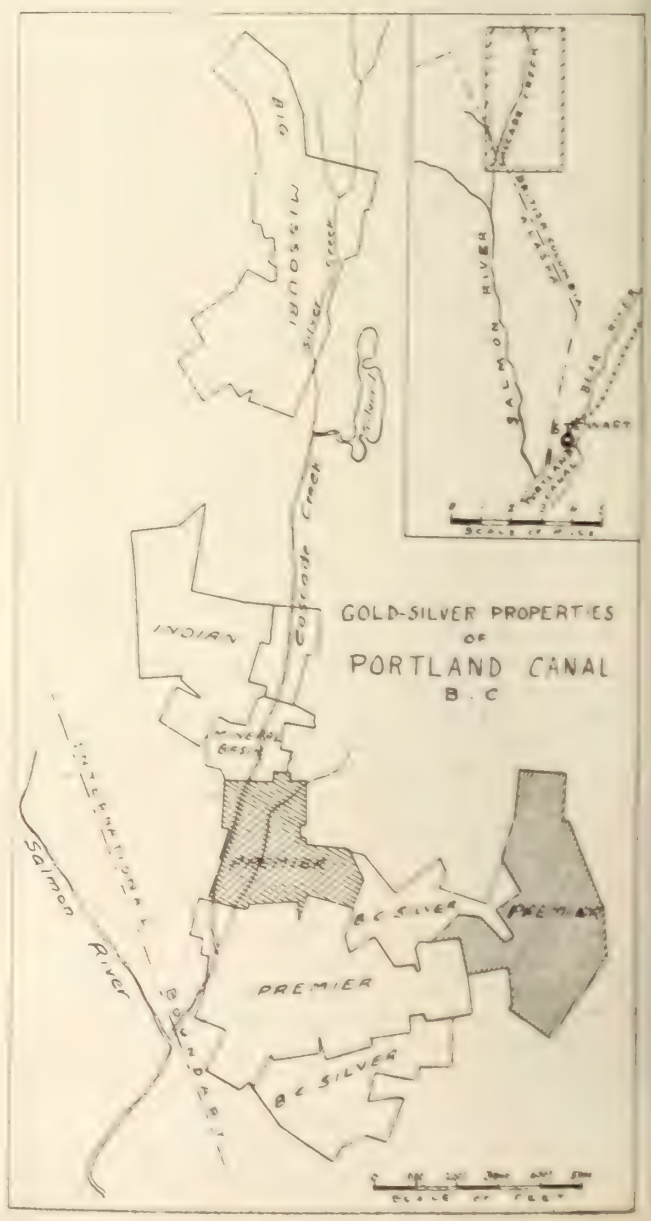
Official documents attest the predominance of the Portland Canal output in precious metals, the 1922 report of the Minister of Mines containing the following:

"The value of lode gold produced in 1922 was $4,089,684, as compared with $2,804,154 in 1921, an increase of $1,285,530, or about 45.9 per cent. The Portland Canal Division, of this, produced a gold value of $2,553,303, or more than the remainder of the Province.

"The feature of the year has been the phenomenal silver production of the Portland Canal Mining Division, which amounted to 4,264,228 ozs. valued at $2,735,076, almost entirely by the Premier Mine.

"The Indian Mines is looking very promising for the amount of work done and is developing large bodies of milling-grade ore. Indications are that this property will justify its being equipped with a concentrating plant within a year.

"The B. C. Silver Mines' recent strike in cutting the extension of one of the important ore-producing fissures of the Premier mine, and the satisfactory values obtained across a width of 25 feet, practically indicates its developing into a very important producer."



Influence of the Premier Emphasized

Pursuant to this review, it is pertinent to further quote ne official report of the Mining Engineer for the Portland anal division as follows:

The fact that the Premier mine of the Premier Gold Mining Company has produced in the last four years approximately 170,000 ozs. gold and 5,650,000 ozs. silver, r about $8,000,000 of which the greater portion is this ear's output, has brought this area prominently before the whole mining world. As a result, this year has had the reatest amount of development done in this section. The esults have more than fulfilled expectations. The ore-odies of the Premier mine have been proved by diamond-rilling to greater depth, showing the values and extent f the ore-bodies to be very gratifying.

"The Indian Mines, Limited, has had about 1,000 feet f development work done on it, on three levels, in drift-ng, raising and crosscutting, exposing a big tonnage of ood-grade milling ore, as well as an appreciable tonnage f shipping grade. The British Columbia Silver Mines, imited, has also done about 1,000 feet of underground work, mainly in driving a crosscut tunnel, toward cutting he extension of north-east of the Premier quartz porphy-ies. This objective was reached early in 1923, the tunnel rosscutting through about 25 feet of mineralized ground, no doubt the extension of one of the Premier fissures, and stated by the manager to carry satisfactory values. Though the ore-body has not been explored to any extent at the time of writing this, there is every reason for believing that the strike is important, and that the property can now be developed into a big enterprise.

"The summer's development on the Big Missouri ground gave sufficient encouragement for the payment of the second installment on the purchase price, and work will, I understand, proceed as soon as conditions permit.

"The interesting of Toronto and Montreal capital in the development of the Indian and Mobile, of English capital in the operations of British Columbia Silver Mines, Limited, and British Columbia capital in the exploration of the Big Missouri, are significant facts and may bring far-reaching results. There is no doubt that next year's operations will greatly exceed this year's and will go a long way towards putting these mines in the shipping class."

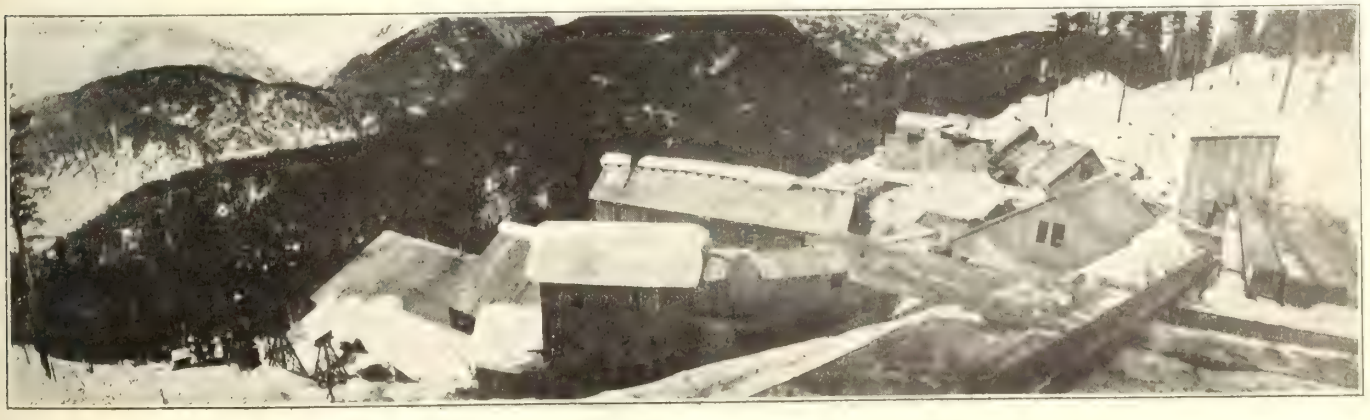
Leading the Way

Safely piloted by the Premier, the group of properties herein officially reviewed has progressed during 1923. Recognition of the vertical limitations of the high-grade horizons has not detracted from the value of the large milling-grade sections. Managing Director Guess in his annual report for the fiscal year 1922 stated that the Premier ore section has widened at depth. There remained in the ore reserves to the lowest working level of that time, 375,000 tons with an estimated gross value of $9,781,960, besides a satisfactory treasury. Model accounting evidenced the thoroughness of the business methods employed. Admitting that the average value of the ore was lower, it was pointed out that the ore reserve estimate applied only to the mine as it existed, not as it might be after further development. On the bottom level the average value of the ore dropped to 0.32 ozs. gold and 5 ozs. silver, nearly $10 per ton. Six diamond-drill holes had cut the ore-body level and indicated that this grade of ore continued to at least a further 100 feet vertical. Mr. Guess explained, however, that there was some 600 feet of unexplored ground to the eastward, along the same ore zone, and that there were possibilities southwestward of the same zone, to say nothing of what there might be to the northwestward and connected with surface showings to the south, on the Cascade No. 8 and Pictou claims.

More Ore Located in 1923

With the information in their possession, while proceeding with mining and development operations throughout 1923 upon a full tonnage basis, the Premier Company succeeded in extending the main ore-body for a distance of over 800 feet on the third level. Mr. Guess is authority for the statement that with a view to enlarging their mine, the company acquired the True Blue, Premier Extension Nos. 1, 2, 3 and 4, Extension Fraction, Mist Fraction, Mist No. 1, and 2, Bluox, Joe Fraction, Paul and Gloria Fraction, as shown by the shaded portions of the map printed herewith.

The object of these acquisitions, is evident. The Company owns about 38 per cent. of the B. C. Silver Mines, Limited, controlled by the Selukwe company. To explore the territory to the south of the Premier mine, situated on Cascade No. 4 and 8, and to reach the orebodies indicated by the outcrops on Cascade No. 8 and the Pictou, a drift is being carried on the 4th level southward, with a distance of 1,800 feet to its objective. At present this drift is 1,000 feet long. To the northwest, in the valley of Cascade Creek, a tunnel has been started from what was known as the Bunting tunnel. This is designed to explore the possibilities of the area from Cascade Falls Claim No. 1, southeast to the main workings. Boxing the compass, therefore, the Premier company is reaching for ore in large enough quantity to feed the new mill, which, Mr. Minor C. Keith is quoted as saying, will have a capacity of 1,000 tons daily. The Bunting tunnel extension, or No. 6 tunnel as it is designated, will be about 500 feet below the 4th. level of the main workings. It is now in



Surface plant of Premier Mine, looking down on the upper terminal of the aerial tramway, eleven miles long to the coast at Stewart. In the background are the hills on which are the Indian and Big Missouri properties.

about 800 feet, and going forward at a record rate of about 250 feet per month. With sufficient territory to protect mining and milling requirements, it is to be noted that the Premier Company has no connection with any other properties in the Salmon River District, excepting the B. C. Silver. It holds an option upon the Northern Light group, upon which it has been doing some surface prospecting during this year.

Premier's Dividend Record

Beginning in 1921, the Premier company has distributed $4,450,000 in dividends, has financed its affairs, has entered upon the development and exploration plans as outlined, and will build another concentrating and cyaniding mill. The present mill has a monthly capacity of 4,000 tons. The aerial tramway's monthly capacity is 10,000 tons. It remains to be seen whether this haulage system will be at all adequate. Bearing in mind that there was approximately $10,000,000 in the main workings a year ago, that a large tonnage of lower grade ore was indicated, that extensions of the richer zone in the upper level were anticipated, the Premier company output and what is in sight may be said to be over the $25,000,000 mark. The new mill will be located at the portal of the Bunting or No. 6 tunnel, about midway between the main workings and the Indian Mines. It may be that the production and dividend performances will not be so exceptional in the future, but there is no doubting the purpose and the confidence of the company. The higher grade ore in the upper horizon will sweeten the large tonnage of lower grade, and it is reasonable to suppose there will be more of the better grade found as development proceeds n the groups of claims owned by the company.

Significance of Strategic Moves

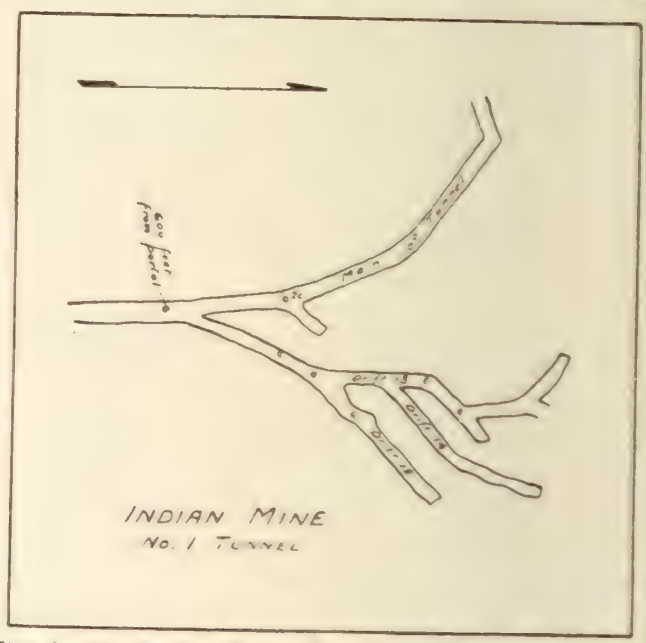
The ground taken over by the Premier Company during 1922 leaves nothing in the immediate vicinity to others, excepting the B. C. Silver properties due north of the mine, and the Indian to the northwest, across Cascade Creek. As about 38 per cent. of the B. C. Silver shares have been acquired by the Premier, the possibilities contained in Cascade Falls Claim No. 5 and in the Oakville Fraction that corners on to the Premier mine on the northeast, are fully realized. North, south, east and northeast. the Premier has all the territory it can handle for a good many years. Whatever is in the same geological horizon and concentrated near-by, the company possesses. in whole or in part. Between the portal of the No. 6 tunnel on the north and the Pictou ground on the south, explorations are being extended for a distance of four thousand feet. the Premier mine being in the center.

The property is receiving the comprehensive treatment it deserves, while the B. C. Silver company is endeavoring to prove up an extension of a Premier ore-body. The Premier zone is ample for these large operations. The nineteen mineral claims and fractions owned a year ago now have been increased to thirty-two, a fact that conveys its own significance. Reference to the shaded portions of the map will bear out the conviction prevailing that the Premier company entertains no half-way measures.

Indian-Big Missouri Situation

Having a fixed, productive standard in the Premier, eastern Canadian interests in the neighborhood naturally are greatly encouraged by the latest disclosures at the Indian Mines and reports concerning the Big Missouri. The narrow valley of Cascade creek intervenes between the Premier and the Indian, and to the north of the latter is the Big Missouri, now held by the men who enlisted the Guggenheim-Keith-Untermeyer group in the Premier. Manifestly the Indian is in excellent company, and the Premier-Big Missouri aggregation is understood to be not at all ashamed of what is transpiring at the Indian, where some of the better grade of ore as stated by the management compares with the best there is in the district, and where the tonnage of milling grade being put in reserve thus far confirms last year's prediction by Mr. Clothier. Undoubtedly the Indian has been fortunate in finding a section of very good ore.

Though Cascade creek separates them, the Premier and the Indian are believed to have similar geological conditions and all the evidences of those crustal movements which justified the participation of influential capital. Recent reports give the Indian both widths and values. No longer can it be contended that the Indian does not possess a share of the favorable quartz porphyry horizon. It is too soon and it would be misleading to classify the Indian as a first dimension mine, comparable with its neighborhood: but it is due to the Clothiers and and their Montreal and Toronto successors in the ownership of this and other properties in process of being acquired, to state that they feel they have most substantial reasons for providing the money needed to prove their extensively mineralized zone. The complicated fissures, the size and nature of the lenses characteristic of the Premier-Indian Big Missouri section, the values and structural variations have exacted "a cautious policy of exploration and development" that has now resulted in the decision to enlarge the scope of operations.



This fan-like section indicates the width of the Indian Mine zone and its possibilities, taken in conjunction with outcrops above a point several hundred feet ahead of these workings.

Indian Corporation Holdings

Fifteen claims and other fractions constituting a solid block are owned or under option. Until the advent of the Montreal and Toronto interests, Indian Mines Corporation held four crown granted claims. Developments on the Portland claims, the outcrops on the Boundary and Morn claims, the prospects elsewhere, prompted the more ambitious operations that now have been awarded. A large zone and longer lines of outcrop are being determined by aggressive underground work and by diamond-drill.

Altogether about 3,500 feet of tunnels, drifts, raises and crosscuts have shown that the zone and its fissurings are persistent for a known lateral distance of at least 1,200 feet at this writing. The intensely fractured zone as described by Mr Turner, "cuts across the general north 20 deg. west strike of the country." Bedded deposits

along the northwesterly strike, are an occasional feature. These Mr. Turner designates as the Northwest Series. To quote him further, and by way of explaining what the management had to solve, "cross fissures on a strike of north 30 deg. east, intersect and cut through the North-South and Northwest Series, but are frequently obliterated at the crossings through a subsequent movement along the North-South vein system."

Aspect Altered in a Year

To ascertain this and to intelligently comprehend the structures as a whole, while putting enough ore in sight to provide optimism, entailed capital expenditure and persistence. Outcrops a'plenty were prima facie evidence. Three tunnels, for a while, did not clarify the situation; even now there is a great deal to learn. A year ago it was recognized that ore-bodies in the workings did not correlate with outcrops. According to Mr. Turner, there was enough in prospect, if not actually proved on the tunnel levels, to warrant the statement by him that the Indian mineralized zone is over 150 feet wide, and that it "can

Portal of Indian Mines tunnel showing main vein

be traced for at least 3,000 feet." A possible outcome of the expenditure of what working capital there was on hand, was 110,000 tons of ore estimated at $1,995,080.

At that time the porperty was not beyond the debatable stage. The lower tunnel and the main tunnel had various lenses averaging $18. Crosscuts indicated other ore-bodies or lenses. It was decided, therefore, to provide more ample working capital, to push the lower tunnel and also to concentrate in No. 1 tunnel, the upper one. Thus far, his decision has brought additional results, which Mr. Turner describes as follows:

"The ore-bodies are all replacement deposits in lenticular form and are found in all the veins, but generally at the intersections of the various fractures or fissures. In No. 1 tunnel, an almost continuous ore-body was extended along a distance of 400 feet from the portal of the tunnel to the No. 13 station but this, properly speaking, is a series of closely-connected lenses."

The accompanying sketch of No. 1 tunnel, showing where the series of veins fork as it were, illustrates the position confronting the management. Of this, Mr. Turner says: "Near the end of No. 1 tunnel all the vein series of different strikes come together. It is here that the best conditions prevail, as shown by the large ore-body being explored from No. 1 tunnel."

It is to be explained that this special reference is to the development in what is known as No. 13 drift: "An average sampling across 26 feet assayed $25 per ton, and other samples point to this average value. This new ore-shoot is explored for about 175 feet in length. Assuming that it will extend to the surface, or near to it, and be of the same thickness and average value, there would be 66,000 tons in the block of ore which, at $25 per ton would contain a gross value of $1,650,000 between this upper tunnel and the surface."

These computations are based upon progressive developments and the line of outcrop. Mr. Turner qualifies them by writing: "I am only giving these figures in order that you may have some idea of the importance of this new strike, and while the ore is not blocked out, this tonnage, on the strength of the evidence seems reasonable, especially as I have made no allowance for the ore going below the No. 1 tunnel, until it is actually drilled and development completed."

While the projection is thus qualified, it is urged that another similar "condition of vein intersection exists on the surface, 400 feet in advance of the present face of No. 1 tunnel"; and other "occurrences of this kind are likely to be met with" under the present plan of development. Included in this plan is the pushing ahead of the tunnel and related drifts, while a series of drill-holes will determine the whole section along to the north. The relationship of the outcrops in this area to the north of the one that is undergoing development, calls for the combined development and drilling campaign; for the Morn area, further north, and the Boundary claims, have outcrops with widths and values deserving attention before the freeze-up. One outcrop on the northerly extension, traced for 270 feet, is said to be 12 feet wide, and averaged $15.

This much having been accomplished in a year, with a section so varied yet offering ore of profitable milling grade, it will be admitted that more could not have been done with the plant available. There is approximately 200 feet of back from the No. 1 tunnel level, and the vein system traverses the main Indian area and extends into the Morn. The diamond-drill and machines underground are expected to make the upper section of the Indian, together with what is exposed in the lower tunnels at date, ready next spring for the mill that is under consideration. Possibly the tunnel can be carried along fast enough to confirm the values at the outcrops, to enable the directors to avail of the winter roads to haul in some of the milling equipment. Certainly the Indian will require a larger power plant to deal with its expanding mining position.

Meanwhile the Big Missouri development is proceeding. Diamond-drilling has located a large section of ore averaging over $20. How much more there is of it has not been stated publicly.

LIFE OF THE RAND

In an statement recently published, Sr. Robert Kotze, Government Mining Engineer, estimates that in 1927 the Rand will be producing 31 millions sterling per annum, and in 1932 the amount will have fallen to 29 millions. The present rate is 37½ millions. These figures involve a decrease of 23 per cent. in ten years.

During the past ten years the imports of kerosene into Finland have decreased thirty per cent., due to the increased use of electricity for lighting, and this in spite of an extension of its use in oil engines.

Undersea Coal Mining in Nova Scotia

Longwall Method Giving Good Results and is Safe and Economical

By JOHN MOFFATT

The success of undersea mining in Nova Scotia was assured long before the public began to realize that there was much of it being done. When it is stated that seventy per cent. of the yearly output of Nova Scotia is drawn from the undersea areas it can be easily understood that the problem of taking coal from under the ocean in Cape Breton is well on the way to a successful solution. Indeed it can be asserted with confidence, backed by proof sufficient to satisfy leading mining engineers, that under-sea mining has long passed the experimental stage, when doubt was entertained of its success and danger of the inrush of the sea was never absent from the mind. The very fact that over 4,000,000 tons of coal were produced from this source during the year and larger outputs are included in the estimate for the coming year, places the matter beyond all question.

The rim of the coal field only is exposed on the coast and is studded with collieries, from which will be drawn at least ninety per cent. of the future output of Nova Scotia. The beds themselves, apart from this narrow edge, are under the sea.

Quality of Coal Improving. — We are not, however, oblivious of the fact that difficulties may be met as this great coal field is developed, which may add seriously to the problems of mining. But up to the present all geological indications and all correlated evidence point to a great unbroken coal field stretching far out under the Atlantic Ocean's bed. All the faulting found on land has disappeared there, and the most advanced workings show uniform strata and regular coal seams, with an increasingly fine quality in some directions, which confirm the opinions of the well-known mining engineers handling this most interesting problem. That there is an almost limitless supply of undersea coal, and that with due care of the entrances now being made it will be safeguarded for future generations, is the belief of these men, whose privilege it is to develop and conserve it in the interests of the province.

Slopes are Well Protected.—It was recognized from the very beginning that much of the coal of Cape Breton Island lay under water and plans were made to give the greatest amount of protection where the workings entered the sea areas. Here the cover is the lightest, and here might be expected the greatest cause of danger, namely rock fracture, or holes reaching far down due to deep erosion in old river beds. The coast waters were all sounded carefully and a knowledge of the ocean bed ascertained. These were found to be shallow within a twelve-mile radius, with rock bottom forming ledges here and there. The large pillars left to support the mine in the early stages when land was left behind greatly reduced the quantity of coal extracted, but these will all be won on the way back, after they have served the very useful purpose of protecting the coal seams at the weakest points.

The courage displayed by the mining engineers of Nova Scotia is well demonstrated by the fact that in one of the more advanced collieries the bord and pillar method of mining has been discarded, and longwall mining introduced. This system is giving good results and ninety-five percent of the coal in the seam is being won. The pillars of a colliery at Sydney Mines having been extracted without untoward results though it was two miles undersea, it was found by actual practice that the system most suitable to these coal fields would be one by which all coal could be taken out at once. This tends to let the measures between the seam and the bed of the sea settle or subside uniformly. As the overlying strata are impervious to water, it was early discerned that the method of mining most successful must avoid rock fracture, and bring on a gradual subsidence.

Longwall Undersea First Tried by T. J. Brown. — The present Minister of Mines, T. J. Brown, was the first to prove this point in Nova Scotia, and he was most successful in drawing the pillars of the famous old Princess Colliery. Since then other engineers have followed his example. The collieries of the Glace Bay district are still in the pillar-drawing stage, but even this method more than doubles the quantity of coal extracted in the early stages of undersea mining. With thicker cover, the longwall method will become universal and as the collieries advance all coal will be taken out. By this method the ocean bed can be lowered without danger of rock rupture, and with a maximum amount of safety to the mine.

Hydraulic Stowage not Required. — The longwall method of mining precludes all necessity for hydraulic stowage and saves the extra expense entailed. Indeed, it is impossible to adopt this system in a coal field lying on an flat angle of inclination miles under water, and in this competitive age no other system, such as filling with waste from mine cars, could be attempted. In the thick, steeply pitching seams of the Pictou coal field hydraulic stowage might no doubt be a success under certain conditions; but the time has hardly arrived in Nova Scotia when it can be put into operation at a profit.

With the necessary protection at the openings of this vast coal bed, the improved methods of mining under thicker cover, the partial electrification of all the collieries, the introduction of the most modern mining machinery, the ever increasing price of coal, the impetus of a great and progressive corporation, and the universal recognition of the natural geographical advantages of the coal fields of Nova Scotia, the future prospect of the mining industry is most pleasing. "The best is yet to be," and the near future is bright with the promise of good things foreshadowed in the minds of those directing the destinies of coal mining in Nova Scotia.

DOMINION PETROLEUM AND GAS REGULATIONS

The Mining Lands Branch, Department of the Interior, Ottawa, has issued a revised edition, superseding that of November, 1922, of the Regulations for the disposal of the petroleum and natural gas rights in the provinces and other areas under its jurisdiction.

Huronian Belt Company's Annual Report

Satisfactory Year for Company that Holds Keeley and Vipond Stocks and Numerous Undeveloped Mining Claims

On October 8th the annual meeting of the Huronian Belt Company was held in London. In presenting the annual report to the shareholders, the chairman, Mr. T. H. Hamilton said:

The report and accounts before you reflect a highly satisfactory position.

If you will turn to the balance-sheet you will observe that your only liability, apart from capital, is sundry creditors, £11,207. On the other side we have sundry debtors, which represent shares sold and not delivered and undistributed balances £20,639, cash in London and Canada £35,200. Since the close of the accounts a further £15,478 has been received in respect of calls on shares. The other item on the asset side of the balance-sheet, cost of shares and interests, £66,357, calls for some elucidation. It represents, among other things, over 100,000 shares in the Associated Gold Mines of Western Australia, Ltd., between 60,000 and 70,000 shares in the Keeley Silver Mines, Ltd., and between 60,000 and 70,000 shares in the Vipond Consolidated Mines, Ltd., besides certain Canadian shares which are not dealt in on the London market. It also covers your properties, which, you will observe from the details given in the directors' report, are considerable both in size and importance. That is a very strong position, on which we may fairly congratulate ourselves. The balance of profit for the year, £26,761, is subject to income-tax, corporation tax, and 5 per cent in favour of the directors. This it is proposed to carry forward.

Developments on Vipond And Keeley Mines

The developments on the Vipond and Keeley mines have been published in the Press from time to time, and I need only make passing reference to them. As you know, they have been eminently satisfactory. At the Vipond the vein known as No. 10 has been opened up during the last few months at the 400 ft., 500 ft. and 600 ft. levels, giving high values over great widths. The Vipond, as you know, adjoins the Hollinger gold mine, and although we have only been at work on the No. 10 vein during the last six months Dr. Mackintosh Bell reports that over two years' supply of ore, averaging over $10 per ton, is in sight, without reckoning a large amount of lower grade stuff. The work now proceeding continues to open up high grade ore, and the mill, which has a capacity of 150 tons a day, is timed to commence production during December next. It is too soon to attempt to estimate the exact significance of these recent developments, but, having regard to the fact that they only apply to a small portion of the company's area, they must be regarded as extremely satisfactory and encouraging.

The South Lorrain Field

The remarkable results obtained at the Keeley mine during the last eighteen months have drawn attention from all parts of the North American Continent to the South Lorrain field. This company, as you know, was not only the sponsor of the Keeley mine, but it was due to its work in the first place that the rich possibilities of the district were recognized. As you will see by the directors' report, we have not been idle in South Lorrain. We have interests in H. R. 22, an area immediately adjoining the Keeley mine on the west, and in H. R. 610, about 1 1-4 miles to the south, but we have to a large extent concentrated work upon a property known as the "Maidens," situated some three miles north of the Keeley and less than half a mile west of Lake Timiskaming. The property comprises H. R. 66, 67, 69, 70 and 72. I quote the official references and numbers of the claims, so that shareholders can identify them for themselves on any map of the field. Some work was done by the previous owners, and four strong veins, showing in places good silver values, have so far been discovered on the property. We have done a good deal of work during the past summer, mainly of a preparatory nature, cutting roads, putting in plant, etc., and actual mining work is only now beginning. The results of that work during the next six or nine months will be of very great interest and significance, not only to us, but to the whole South Lorrain field. The theory, of course, is that we are dealing with a similar proposition to the Keeley, and that we may expect a zone of great enrichment when we approach the contact of the diabase and keewatin.

Energetic Development Programme Justified

The point is one upon which I offer no opinion of any value, except to say that Dr. Bell's considered estimate of any South Lorrain proposition must carry the greatest weight. In the course of the report, to which reference is made in the directors' report, Dr. Bell sums up the position with regard to this property as follows:—

"It seems unreasonable to suppose that the four principal veins so far discovered, and the various minor veins, represent all the property contains; it is altogether probable that others will be discovered during the progress of the sub-surface operations. The known veins are limited to keewatin rocks, and have been opened up only at what is thought to be a considerable distance above the diabase-keewatin contact. At such shallow horizons the silver content should theoretically be much less than at deeper horizons nearer the contact. Yet even at this distance at least one vein (No. 1) shows a substantial silver content, which increases in amount downwards. The chances for the discovery of shoots of silver-bearing cobalt ore of commercial size, when development has been carried out at favorable horizons, at or near the diabase-keewatin contact, are excellent. I believe the implications amply warrant the carrying out of an energetic development programme."

New Interests Acquired

To that restrained opinion I need only add that the Board attaches such importance to the company's holding in the "Maidens" that it has, on Dr. Bell's advice, acquired interests and options in the surrounding properties H. R. 509 and 520, and T. 19, 262 and 19,263, so that if the theory upon which we are working proves correct we shall be controlling a very large area.

Our interests outside South Lorrain include a three-fourths interest in three claims next to the Murray Mogridge gold mine, and two claims in the Rouyn township district on the Quebec-Ontario frontier, a goldfield which is in its infancy, as the first discoveries were only made last year shortly before the snows commenced. Work during this summer in this field has been exceedingly encouraging, and at one or two points deposits have been opened up at or near the surface which would appear to be of great promise.

We are also shareholders in the Noranda Syndicate, controlled by an American group, which is the largest

claim-holder and, in a sense, the pioneer of the district. The latest reports from the Noranda Syndicate, which came to hand last month, would appear to justify the expectation that a great deal will be heard of thiis district during the next twelve months.

We are also considerable claim-holders in the gold-mining district of Sault Ste. Marie. We have not given detailed particulars of our holdings in this particular field, partly beause full reports have not yet come to hand, and partly because our work there has not yet come to an end. It is too early to pass a definite opinion on the strength of surface prospects, but, as the directors' report states, Dr. Bell has a very good opinion of its chances, and we are devoting a good deal of attention to it before the winter sets in.

The Company's Financial Resources

From this brief survey of our holdings you will see that they are considerable in point of area, and they are the outcome of investigation and examinations conducted systematically over some years. It is satisfactory to know that the resources of the company are commensurate with its properties.

You will realize from what I have already said that the position to-day is that, when the whole capital of £200,-000 is issued, the balance of cash and liquid resources, including only shares dealt in on the London Stock Exchange, will exceed £250,000. That is a somewhat exceptional position, especially having regard to the money we have expended upon exploratory work on properties since abandoned. It reflects, as most of you know, the results of some years of hard work, and is due, of course, in part to the fact that this company started as an exploration company, with no promoters to consider, and its capital, practically in its entirety, was represented, in the first instance, by cash. I need not point out that this question of financial strength is of great importance to a company of this character. This is not in any sense of the word a holding company, although we shall, no doubt, from time to time hold considerable numbers of shares. Our work is primarily that of acquiring the control of promising properties in Ontario, or elsewhere, in their early stages, of bringing them to the point of development at which we can obtain participants on profitable terms, and distributing those profits to our shareholders in specie or cash, or in both. This does not necessarily involve any large expenditure, but it may do so, and it is an enormous advantage to know that you can pursue your programme independently of market fluctuations or conditions, and if need be, independently of other partners.

Staff and Organization

I feel I should say one word regarding our Canadian staff and organization. Our work is, of course, to some extent seasonal. In the spring, summer and autumn, when the snow is off the ground, it is largely taken up by examinations of prospects, and in the winter, when that is not possible, by actual mining work. I believe that in both these branches our staff is second to none. In our managing director, Dr. Bell, we have not only a brilliant geologist, but a very capable organiser and he has under him young and highly-trained engineers who know the country and its conditions and who are ready at short notice to go to any point of the compass that offers the promise of attractive business. They have, as you can see from the report, not been inactive, and we have during the last few years accumulated a mass of data, some of a positive, and even more of a negative character, which, however, is scarcely less valuable. I think I can say two things with confidence. One is that the mining developments in Canada, and particularly in Ontario, wil in the course of the next few years attract increasing at tention the world over, and the other is that you have a staff, both on the business and on the mining side, com petent, efficient and active, which is eminently qualifie to play a useful and profitable part in those developments I feel sure that I am echoing your views in expressing our appreciation of the work that has been, and is being done.

LIQUID OXYGEN EXPLOSIVE IN COLORADO

Liquid oxygen explosive has been successfully used in Colorado in experimental mine blasting and road construction work at a cost of approximately one-half that of the gelatin dynamite required to do the same work. The experiments were conducted by E. D. Gardner, mining engineer of the United States Bureau of Mines, in co-operation with a representative of the Compressed Air Corporation.

A liquid oxygen explosive consists of gas black, wood pulp or some other carbonaceous material made up into cartridges and soaked in liquid oxygen. . This explosive can be detonated similar to ordinary dynamite with cap and fuse or with electric detonators. The liquid oxygen was obtained from a plant designed to furnish oxygen gas and was shipped to the point of use in Dewar flasks, which are made on the same principle as thermos bottles. The first Colorado tests made by the Bureau of Mines were conducted with cartridges made in Germany, but later cartridges manufactured at less cost in Denver proved very much more satisfactory.

As the use of this explosive is new in this country numerous tests and experiments were necessary to find a low-priced carbonaceous material which would have the desired qualities and to learn the technique of blasting with this new material.

Hand steel holes were blasted in granite on a road construction job above Idaho Springs, with results similar to those obtained with 40 per cent gelatin dynamite. Trees were also cleared from the right-of-way and a 200-ton cliff blasted down successfully. . Instantaneous electric detonators and blasting battery were used for this work and no misfires occurred and no holes failed to break properly. The oxygen was taken to the job in an automobile and the quantity not used was taken back to Denver. The small-sized cartridges were made on the ground from German material.

Regular drift rounds were blasted on the 200 level of the Yak mine. The oxygen was expressed from Denver and a cartridge developed and made at Denver was used. Eleven and 13-hole rounds, 4 to 5 feet deep in a 7 by 8-ft. drift, in firm limestone, were successfully shot with the liquid oxygen explosive. The rounds were loaded and blasted by two men in 8 to 12 minutes, which was well within the life limit of the cartridges. The blasts were made according to the standard practice in western mines with time fuse and caps. The rounds were broken clean in each case and the broken material was finer than was blasted with 40 per cent gelatin dynamite. Disregarding the express charges on the oxygen, the cost of this liquid oxygen explosive was about one-half that of the gelatin dynamite needed to break the same round. As far as is known, these are the first blasts of regular drift rounds made in the United States.

Besides costing less, the liquid oxygen explosive is much safer to use than ordinary dynamite. There are disadvantages resulting from its use, however, and much is yet to be learned before it can be universally adopted in metal mines.

WORLD'S COPPER CONSUMPTION

Speaking before the American Mining Congress in Milwaukee, Wiliam A. Willis, manager of the Copper & Brass Research association, said that partly as a result of work of the association in the last two years there has been an increase in domestic consumption of copper of at least 75 per cent.

"Of course," he said, "the full fruits of the campaign will never be felt until the situation abroad improves, because it must be remembered that the American copper industry was built up to its present proportions on the basis of a certain fixed foreign demand. This foreign situation seems to be gradually improving. but there can be no question it is primarily responsible for the low price of copper over the past few months, in the face of so hugely increased a domestic consumption.

"During the last eight months world consumption of new copper was approximately 230,000,000 pounds a month, which is at the rate of 2,750,000,000 pounds a year. Of this monthly consumption 192,500,000 pounds was supplied by American mines and refineries. These figures show that despite European conditions consumption over the eight months mentioned has been within about 10 per cent of war peak and more than 12 per cent above the pre-war world rate.

"August consumption of copper was the largest for any month of the year and was actually in excess of production. It can be seen from all of this that the copper industry is in a reasonably healthy state and that with the recovery of Europe it should not be long before the metal is bringing a price commensurate with the cost of production, making possible a fair return on the capital invested."—Iron Ore.

MINERAL DEVELOPMENT TO STIMULATE EMPIRE MIGRATION

In discussing Empire migration in a recent issue, the "Mining Journal" of London remarks:

"In the past, mining enterprise has been the most effective agency for inducing immigration into new countries: Australia, New Zealand, Kimberley, the Rand, Rhodesia, California, owe their start in life almost entirely to mineral discoveries and the lure of fortune appealing to individuals of every class of our population. But the appeal was not made by the mining industry generally; it was the lure of the precious metals, gold and silver, and of the diamond the prospects of finds which might bring affluence to the individual whose capital was little more than good health and good fortune, which produced the immigrations of the 'fifties, 'sixties, and 'seventies, and created the class of adventurous prospector which so powerfully supported mining in Colonial fields in subsequent years, and which is now exhausted. Modern mining is generally on a far vaster scale, involving low-grade ores, large capital, and employment underground, differing but little from what is available in established mining centres everywhere. Moreover, the prospects of gold finds are not what they were, and mining is largely of the base metal order, intrinsically far less attractive to the individual adventurer. The field of immigration, too, is narrowed by restrictive measures such as that imposed in the United States, and in a lesser degree in most of the Dominions. Spontaneous emigration of this type postulates the discovery of new mineral fields, which is precisely what has been conspicuously lacking of late years. If we have to rely upon constructive efforts to develop mining in the Dominions, we confess that we shall be curious to learn what is proposed. General Smuts suggests that we should buy our copper in Africa, more especially apparently from Tanganyika. How it will benefit this country to buy Belgian rather than American copper we do not know, and these are the only two sources from which the metal can be produced at the present time at current prices. A preference for Empire metals is a very attractive idea, but, considering the necessity of maintaining our export trade, we cannot imagine how it is to be organised or made really effective without cutting very severely at existing business undertakings, and through them at employment.

CYANURIC TRIAZIDE AS DETONATOR

Tests of the detonating properties of cyanuric triazide, made by the Department of the Interior at the Bureau of Mines experiment station at Pittsburgh, developed that this compound is a very efficient detonating agent, but is too sensitive to handle safely in large quantities. It is especially sensitive in the form of large crystals such as may be formed from fusion or re-crystallization. It is non-poisonous, but the materials used in its manufacture are irritating and poisonous.

Cyanuric triazide was discovered and patented by Erwin Ott, and on account of his claims, the Bureau of Ordnance, U. S. Navy, desired more complete data, so an investigation was made by the Bureau of Mines. The results obtained were such that the Bureau of Ordnance recommended publication thereof for the benefit of the explosives industry.

Cyanuric triazide is insoluble in water and slightly soluble in cold ethyl alcohol, but it is soluble in acetone, benzene, chloroform, ether, and hot alcohol. It melts at 94 deg. C., and there is decomposition when heated above 100 deg. C. In the molten state it is very sensitive to friction. If heated slowly, it may entirely decompose without detonation, but detonates quickly by flame or sudden heating. The small crystals are more sensitive to impact and friction than mercury fulminate and have detonated when being pressed in a detonator capsule. The large crystals, such as may be obtained from fusion or recrystallization, have detonated when broken by a rubber policeman.

Serial 2512, "Preparation and detonating properties of cyanuric triazide" by C. A. Taylor and Wm. H. Rinkenbach, may be obtained from the Department of the Interior, Bureau of Mines, Washington, D.C.

TIN IN NIGERIA

For the three years 1919-21 Nigeria exported an average of 8,000 tons of tinstone. The mineral was found to occur in the Protectorate only recently, and a prompt investigation, on the initiative of the Imperial Institute, resulted in its discovery in numerous widely separated localities, while workable deposits were found in the northern provinces.

Quebec's Water Powers and their Relation to Other Natural Resources

As an indication of the good work of education and propaganda being conducted by the agency of radio, we print the following broadcasted recently from Montreal by Dr. W. G. Kennedy:

The potential and actual wealth of the Province of Quebec, is vast and varied; the forest, the mine and the water power, each in its turn is among the largest of its kind in the world, and each is a source of development and prosperity complete in itself.

It is of the immense water powers of the Province I would speak to-day, the development of which, measured in electric energy, is such as to make it possible for the Province of Quebec to become one of the large industrial centres of the world.

Distributed throughout the Province are sufficient waterfalls and rapids to generate approximately 15 million horsepower in electricity. There is no other area in the world of like size that has such vast potential hydro-electric powers and the very fact of their wide distribution reduces the cost of development and distribution to a minimum. For instance the City of Montreal receives the whole of its electric supply from within a radius of seventy miles, even though there are three sources of supply.

"White Coal"

To date about one-fifteenth of Quebec's water powers have been developed, or to be exact, 1,078,883 horse power. This amount of electric energy means the economical running of many industries, the efficient public lighting of many cities, towns and villages and the supply of illumination to hundreds of thousands of stores, homes and farms, at prices much less than in the days of the tallow candle, the paraffin lamp or gas. The harnessing of her waters has brought much comfort and benefit to Quebec's people. It is calculated that the developed power of the Province is equivalent to the burning of 8,000,000 tons of coal per year. As the Province of Quebec has no coal beds of its own, all the coal used must be imported. This means that if science had not shown us the way to utilize our white coal as a motive power, the province would be in a sorry state indeed. The great industries of our cities, and towns, the pulp and paper mills of our outlying districts would still be merely a dream, for the cost of motive power would be prohibitive.

The industrial development of the Province is the direct result of, and depends almost entirely on its water power development. The one keeps pace with the other, and no more.

Terms of Lease

The development of the water powers of the Province is partially the result of private enterprise, and partially the result of governmental activity. Up to the year 1884 water power sites were sold outright and many waterfalls passed into private hands. In that year the Government passed a law which reserved to the Crown a width of 200 feet along all non-navigable rivers. As the water-powers became more valuable the Government imposed stricter conditions on those who acquired them, and also demanded better prices. For instance, Shawinigan Falls under the new conditions of that time, were sold for $60.000, with the proviso that three million dollars be spent in their development. This condition of course has been carried out in its entirety.

In the year 1909 the Government introduced a system of leases to take the place of the old system of sales. That is, instead of selling a water power outright, the Government leases it for a period of 99 years Under this system, the lessee, after fulfilling his obligations, becomes to all intents and purposes the actual proprietor for the duration of the lease. The lessee can mortgage or sell the property and make and enjoy any improvements he likes; but at the end of the lease, the lessor, or Government, takes back the property and all the improvements made thereon. In this way, while the lessee enjoys special privileges, not granted in an ordinary lease, the people remain the owners of the site for all time.

These are the conditions that govern the development of the Cedar Rapids of the St. Lawrence River, and those by the Southern Canada Power Co., on the St. Francis River. As an indication of the intrinsic value of the water powers to the Province, I might say that the rentals from leases and from the Government storage reservoirs amount to more than $300.000 yearly.

Storage Dams

The governmental activity in the development of the Provincial water powers has taken the form of the construction of dams so as to insure a constant supply of water all the year around. For this purpose a special department was created in 1910, under the supervision of the Minister of Lands and Forests. A little later the Quebec Streams Commission was established, and it is this authority that has the control and regulation of all the rivers and waterfalls of the Province.

Under this authority the Gouin dam and reservoir on the St. Maurice river, the Allard reservoir on the St. Francis river, and the reservoirs on Brule Lake and Savane river, were built, and other works of vast magnitude are now under consideration.

The Gouin dam and reservoir, which is located at the head waters of the St. Maurice river, is the largest works of its kind on this continent. It stores more water than does the famous Assuan dam built on the River Nile by the British Government. Its water area is over 300 square miles and its holding capacity is 160 billion cubic feet. This development, which cost in the neighbourhood of $2,500,000, more than pays for itself. Last year the reservoir yielded a revenue of $212,459, from the four companies that use its stored water. After deducting interest on the capital expended and taking care of a sinking fund to redeem in thirty years the bonds issued to provide the cost of the work, a substantial profit is left over for the Government.

It is the waters of the St. Maurice river that provide the energy supplied to the Cities of Montreal and Quebec, and all the intervening towns and villages. From the power houses of Shawinigan Falls and Grand'Mère the power is carried to all these places by huge cables strung on steel towers.

The St. Francis river dam and reservoir has a storage capacity of 12 billion cubic feet, and supplies the many industrial establishments of the Eastern Townships.

New Works

The Streams Commission has now under contract the construction of a storage reservoir in lake Kenogami, so that the pulp and paper mills located at Chicoutimi and Kenogami may be insured a steady supply of power. Already 61,000 horse power has been installed.

Within the last few months the Government has entered into a new phase of power development. Contracts have been let for the utilization of the waters of Lake St. John and the north shore of the Gulf of the St. Lawrence. This utilization will mean two enormous developments, the one a minimum of 230,000 horse power at a cost of $12,000,000, and the erection of mills costing upwards of $15,000,000, and the other the operation of some of the great water-powers of New Quebec.

One might go on enumerating the different power developments of the Province, but I have quoted enough to show something of the tremendous range of our water powers, and their value in the development of the vast natural resources of Quebec.

TEST SHIPMENTS OF ORE TO OTTAWA

In the past those shipping ore from the West to Ottawa for tests in the laboratories of the Division of Ore Dressing and Metallurgy of the Mines Branch, under the direction of W. B. Timm, have had the disadvantage of high freight or express charges. In order to equalize these charges somewhat as between east and west, the Department of Mines has included in its new regulations a provision that "freight charges in excess of 75 cents per 100 pounds, and express charges in excess of $4.00 per 100 pounds, will be paid by the Department of Mines. On car lot shipments proportional freight charges will be paid by the Department." For small scale tests not less than 100 pounds, and for large scale tests not less than one ton will be accepted. In cases where communication is difficult a shipment from 50 pounds to 2,000 pounds in weight will be accepted; from 50 to 200 pounds in weight it may be sent by either express or freight; above 200 pounds it must be sent by freight. All shipments must be certified by a resident mining engineer, a mining recorder or some other competent authority as worthy of being tested. On page 832 of our issue of October 19th, in correspondence from British Columbia, some of the above regulations were cited erroneously.

USE OF PREPARED NON-METALLIC MINERALS IN CANADA

The possibility of establishing grinding plants in Canada to produce the many varieties of finely ground non-metallic minerals used in Canadian industries is the subject of a comprehensive report prepared in the Mining, Metallurgical and Chemical Branch of the Dominion Bureau of Statistics. Heretofore, though extensive deposits of the crude material are known to exist in Canada and though these deposits are in certain cases being worked, the bulk of the supply has been derived from importations. It has been suggested that it is feasible to substitute Canadian products for certain of these importations, and it is the purpose of the report now described to present the data required for computing the probable extent of the substitute market which might thus be developed.

With the exception of sulphur in the native state, whiting and some special grades of clay, Canada possesses important deposits of almost all the non-metallics most commonly used in industries. The minerals now being consumed in Canada in the ground or prepared form are: actinolite, barytes, calcite, whiting, dolomite, corundum, feldspar, fluorspar, gypsum, lime, magnesite and magnesia, mica, iron oxides, quartz or silica, including silex and flint, tripolite, and talc. Of these, gypsum and magnesite are produced in considerable tonnages, are calcined and otherwise prepared in Canada and supplied in the ground form and larger sizes to consumers both in Canada and abroad. Talc is ground and produced in several marketable grades which are shipped to consumers throughout Ontario and Quebec as well as the United States. Lime is mainly used as crude quicklime in the building trades, pulp manufacturing, sugar and glass-making industries and a limited amount is used as lime-flour. Actinolite, quartz, feldspar and mica are now being prepared to a limited extent in Canada.

Copies of the complete report may be had by those interested on application to the Dominion Bureau of Statistics at Ottawa.

STRENGTH OF T N T

Trinitrotoluene is made by the direct nitration of toluene by a mixture of nitric and sulphuric acids. The exact procedure varies, but the product, where Grade I of TNT is desired, is similar, and consists largely of material that has a melting and setting point of 80.6 deg. C.

The purification consists of draining off the liquid portions, including the acid and liquid nitro compounds. The mass is crushed and washed until the TNT is acid-free. It may still have a low melting point due to the presence of material of lower nitration. Other insomers also have the same effect. The crystal mass may be washed with a solution of sodium sulphite, thiosulphate, sulphuric acid, or with an organic solvent such as alcohol, benzene, or carbon tetrachloride. Where a very pure product is desired, the TNT is separated by fractional crystallization from solution in organic solvents.

In some cases the material is melted during purification. The TNT is agitated as it cools to prevent solidification in a solid mass. If it forms in a solid mass, this is broken up and screened. There has been some question as to the effect of the different methods of purification on the strength and sensitiveness of TNT, although all methods left a product that would give satisfactory tests.

The results of experiments made by C. A. Taylor, explosives chemist, and R. D. Leitch, assistant explosives chemist, to determine the strength and sensitiveness of TNT, using the laboratory "sand-test" bomb, are given in Serial 2526, which may be obtained from the Department of the Interior, Bureau of Mines, Washington, D. C.

AIRSCREWS FOR MINE FANS

In a paper presented recently before the Chemical, Metallurgical and Mining Society of South Africa, Mr. F. A. Steart gave the result of an extensive series of experiments in the use of the propellor blades used in airplanes for causing a flow of air against a light head, as in mine ventilation. Though the experiments are incomplete, it has been shown that efficiencies comparable to those obtained with centrifugal fans are feasible with the use of these blades.

COAL OUTPUT IN JULY

The Dominion Bureau of Statistics' latest report shows that the output of coal from Canadian mines during July amounted to 986,400 short tons, a decrease of 25 per cent. from the tonnage for the previous month, and 14 per cent. from the average for the month of the three preceding years. The output for the month showed decreases of 435,000 tons in Nova Scotia, and 4,000 tons in New Brunswick. In Alberta there was an increase of 106,000 tons, in British Columbia 6,000 and in Saskatchewan 2,000 tons. The cumulative output from all mines for the seven months of 1923 amounted to 9,717,000 tons, an increase of 20 per cent. over the preceding three-year average for the same period.

Imports for the month from the United States and Great Britain were 2,445,000 tons, which is 58 per cent. greater than the preceding three-year average. The total importation of coal for the seven months of the year was 12,648,000 tons, an increase of 53 per cent. over the three-year average for the period. Evidently the people of Ontario and Quebec are commencing to take time by the forelock in their winter supply of fuel, both domestic and industrial.

The total number of men employed in the coal mines of Canada during July was 27,304 of whom 20,202 worked underground and 7,102 were surface men, as compared with 20,615 underground and 7,054 on surface in June. The production per man was 36 tons for July as against 47 tons per man in June. An examniation of the "Tonnage Lost" for July shows great losses in Nova Scotia due to labour troubles while the mines of the western provinces were again handicapped by lack of orders.

WHO PAYS FOR THE ACCIDENTS?

This question is discussed by Richard V. Ageton, Deputy Mining Supervisor of the United States Bureau of Mines, in Serial No. 2535, issued last month. From data collected by two large companies who carry their own insurance and maintain hospitals and medical staffs, the injuries are classified and the loss per injury computed. In both companies the majority of accidents occurred to the hands (including the thumbs and fingers); the eyes; and the feet and toes. In "A" Company, the greatest number of injuries occurred to the hands (including thumbs and fingers), with the eyes second, and the feet and toes third. In "B" Company, the hands (including the thumbs and fingers) were first, the feet and toes second, and the legs third. There are some differences, for instance it seems that injuries to the head and face in "B" Company were less costly in wages lost than in "A" Company. Also hernia is apparently less expensive in wages lost among employees in "B" Company than among employees in "A" Company, but this may be largely due to the fact that "B" Company employed a physician who had made a special study of hernia operations, and who is one of the foremost physicians in this line of work in the United States, consequently these men were able to return to work much sooner than the men of "A" Company.

It was found also that 48.1 per cent. of the injuries occur during the first two months of employment, and that 20.5 per cent. of the injuries occur during the first week. Therefore, many of the accidents occur before the man has become accustomed to the work in that particular mine. Consequently, if the work on a contract basis, as the majority of it was in these two mines, the man had not become trained enough to reach his maximum earning capacity, or to give the company full value for the money being paid him.

Every mine and every level or working place in the mine where a distinct kind of work is being done has its individual hazards, and should therefore be studied by the men working there, and by the boss in charge of that part of the mine. Such a study must be supplemented by studies of wider scope, insofar as hazards, apparently similar, may exist in other mines. Much can be done by the safety bureau and the medical department, if they work in close harmony with each other and with the individual miners. The entire mining industry will most quickly lessen the hazards of mining by keeping uniform accident records that will facilitate the scientific study of accident prevention by companies working individually or in cooperation with other companies and with local and Federal safety organizations.

ACTIVATED CARBON

Activated carbon has become an important metallurgical reagent, in addition to its uses in industrial chemistry and its original use in the gas mask. It is still prepared most successfully from the shell of the cocoanut, whose minute and multitudinous capillary pores present a very large surface to the reaction promoted by the contact of carbon and the gas or liquid being treated. In addition to its numerous commercial uses dependent upon its power to absorb gases it is used to condense the gasoline contents of natural gas and the benzol of coke-oven gas, to store gas, and as a catalyst. As a catalyst it is used already to convert hydrogen sulphide into sulphur and water, to accelerate the oxidation of nitric acid as much as 500 fold, and to promote the chlorination of hydracarbons. A cylinder filled with activated carbon will contain 66 per cent more nitrogen under a pressure of 35 atmospheres than the empty cylinder.

ORIGIN OF PETROLEUM

The origin of petroleum in nature is still undetermined. It might well have been formed from the vegetable matter that is now represented by coal beds, but for the fact that there is much more hydrogen in the petroleum than in the gases from the vegetable remains. Recent experiments tend, however, to support this idea. By exposing coal to hydrogen under a pressure of 5,000 pounds to the square inch, a remarkable exothermic reaction takes places that results in a fluid indistinguishable from crude petroleum. This opens up an interesting field for speculation as to the possibility of converting solid fuel to liquid fuel on a commercial scale.

THORIUM MINERALS IN CEYLON

Until recent years the world's supply of thorium came from monazite from Brazil, and was under the control of a German firm. Now thorium is being recovered from monazite sands in Ceylon, which afford a small annual supply. The discovery and investigation of these deposits has been due largely to the efforts of the Imperial Institute, which has an especial charge over the raw materials of the outlying parts of the Empire.

MOTOR FUEL FROM HEAVY OIL BY HYDROGENATION

In the August issue of "Fuel in Science and Prac-e," Mr. H. G. Shatwell writes on the "Hydrogena-n of Hydrocarbon Oils."

Mineral oils, containing as they nearly all do, cata-st poisons like sulphur and asphaltic compounds, do t readily lend themselves to treatment with cata-sts, especially finely divided metals, and it is for is reason that so much interest has recently been inced in the Bergin process of hydrogenation, hereby a catalyst is specially stated not to be used.

The Bergin method of hydrogenation consists in ating a heavy oil to a temperature of about 400 deg. for several hours in the presence of hydrogen, nder a pressure of approximately 100 atm. (1,500 s. per sq. in.). It is claimed that large yields of a veet-smelling, saturated motor spirit are produced d that the residue can be again hydrogenated to give still greater yield of low-boiling products. Further, e deposition of carbon and the formation of gaseous drocarbons are so slight that there is no difficulty elaborating a continuous system of treatment, while e Bergin process is also capable of dealing with pe-oleum oils which contain high percentages of carbon, d which, hitherto, have not been successfully acked.

This high-pressure method of hydrogenation has but cently emerged from the experimental stage. Much luable work on the hydrogenation of coal, lignite, al tar, and various hydrocarbons is being carried t by Fischer, Schneider, Schrader, and others at ülheim, Ruhr, while similar investigations are being ndertaken in this country, both from scientific and chnical consideration.

OST OF LOW-TEMPERATURE CARBONIZATION PRODUCTS

During a tour of inspection, one of the engineers of he Ford Motor Co., gave some interesting calculations ith regard to the Caracristi and Piron lead-bath low-mperature process being installed at the works.

He stated that they would be able to make gas for ½ c., instead of 50 c. or 60 c. per 1,000 c. ft., which as the production cost at present. In addition to this, hey would secure light oil, suitable for use as a gaso-ine substitute, for 7.3 c. per gall., and sulphate of am-nonia for less than 2 c. per lb. Further, there would e a heavy oil residue which would cost them 2.5 c. er gall., and could be re-distilled into a gasoline sub-titute for 6 c. per gall. There would be creosote oil or timber preservation at a cost of 7 c., and a heavy uel oil for 3.5 c. per gall.

The coke produced would come off in sheets at the ate of 25 ft. a minute. This sheet coke was easily pul-erised, and, when mixed with a suitable binder, would nake an excellent fuel briquette adapted for domestic se. This fuel could be burned in a house furnace in-tead of anthracite, and could be distributed for one-alf the cost of anthracite. — Gas Journal.

OXYGEN-OIL EXPLOSIONS

The second of a series of papers presenting the re-ults of an investigation being made by the United States Bureau of Mines, on oxygen-oil explosions, deals with the spontaneous ignition of metals in oxygen nder pressure. The experiments described in this paper were undertaken to determine (1) the relation-ship between oxygen pressure and the ignition tem-perature of the metals most frequently used in high-pressure oxygen apparatus and (2) the metals most suitable, as regards safety and freedom from combus-tion, for use in high-pressure oxygen systems. A study was made of the relation between ignition tem-perature and pressure for iron, copper, and brass, which are the three materials usually employed, and for lead.

It was found that, under high oxygen pressures, iron and steel burn very readily and completely, and if once ignited propagate a flame with almost explo-sive velocity. On the other hand, brass and copper appear to burn only very slightly. With brass, a slight combustion apparently takes place.

It would seem that the use of iron or steel in the construction of manifolds, etc., might be a dangerous practice once the material is raised to its ignition tem-perature. It seems probable that copper, and per-haps brass, would survive a higher temperature than steel, and, at most, should any condition cause the manifold and piping to reach a temperature sufficiently high to melt the metal, it would merely melt away and release the oxygen, without burning or propagating a flame.

The lowering of ignition temperature with increase in oxygen pressure is shown graphically and, so far as known, has not previously been demonstrated in any published experiments. The greatest change noted is in iron. At atmospheric pressure, iron in oxygen ignites at approximately 930 deg. C., while at 2,000 pounds per square inch the ignition temperature drops to approximately 600 deg. C.

The results of these experiments are given in Serial 2521, by J. J. Jakowsky, assistant engineer, and E. W. Butzler, assistant to physicist. A general outline of the problem of oxygen-oil explosions being studied has been given in the first report, Serial 2507. Copies of either or both reports may be obtained from the Department of the Interior, Bureau of Mines, Wash-ington, D.C.

GRATES AND FURNACES FOR LIGNITE CHAR

Grates suitable for burning lignite char in an or-dinary cook stove have been designed by the United States Bureau of Mines, and tests run in the labor-atory at Pittsburgh proved that they will burn this fuel successfully. In order to prove that this fuel is practical in the preparation of meals, this range, equip-ped with special grates, and a cooking stove of Ger-man origin, were installed at the domestic science school of the Carnegie Institute of Technology, where they were actually used for cooking. Later the Ger-man stove was removed to the residence of a Bureau of Mines employee, where a test of lignite char under actual household conditions was made. In both cases the lignite char proved an admirable fuel, and was said to be second only to gas in its convenience and prac-ticability.

A practicable heating stove of the base burner type was also developed, with a special magazine feed, cone grate, and a shaking grate for ash removal.

Further work will be required to develop a grate which may be considered entirely satisfactory for burning lignite char under heating boilers. The chief difficulty is in the riddance of ash and clinkers at higher ratings.

AIR-SWEPT TUBE MILLS

Ball and tube mills have become the most important machines of the day for fine crushing. Their maximum capacity is not developed ordinarily, however, because of the prevalent practice of allowing finely ground material to remain in the mill, along with coarse particles, where it impedes the crushing action of the balls or pebbles. Numerous expedients have been developed, in both wet and dry grinding, with a view to overcoming this difficulty, and in some cases a distinct improvement in both capacity and cost has resulted.

The Kennedy Air-Swept Tube Mill, made by the Kennedy-Van Saur Mfg. & Eng. Corporation, 50 Church St., New York, has demonstrated conclusively the economy of removing the crushed material as soon as it has reached the required degree of fineness. For a number of years they have experimented with the principle, and for the last two years have had their new mill in operation in commercial plants, where they have tried it out on various kinds of material with highly satisfactory results.

The photograph herewith shows a plant used for pulverizing limestone for agricultural and other purposes. The 6 ft. by 12 ft. Air-Swept mill produces 11.8 tons per hour of which 84.5 per cent. passes through 200 mesh, 94.8 per cent. through 150 mesh, and 99.2 per cent. through 100 mesh. A draft is induced through the mill by a 60-inch fan which lifts out the smaller particles as soon as they are formed. The speed of this fan can be regulated to give whatever degree of fineness is required. The dust is separated in cyclones, of which three, of 7-foot, 10-foot and 4-foot sizes, are used in the above plant. All the dust from the 10-foot cyclone passes through a 350-mesh screen.

The motor required for this mill is of 125 H.P., and for the fan, 12 H.P. In operation the mill consumes less than 11 H.P. per ton per hour, in producing the material noted, while the ordinary mill requires 25 H.P. or over when making a coarser material.

In addition to its use in the manufacture of cement, in various chemical plants and in pulverizing coal, this principle of air separation is already finding a general use in the grinding of feldspar and flint for the ceramic industries. In this case, of course, flint pebbles must be used instead of steel balls. It seems possible that it might be used to advantage in the separation of asbestos fibre from the enclosing rock, as the fibre would be removed as soon as released and thus subjected to a minimum of the destructive cutting action.

PREPARATION OF SUPER-REFRACTORIES

Experimental work in the development of refractories from artificial sillimanite designed to be superior to the natural refractories now in use is in progress at the Northwest Experiment Station of the United States Bureau of Mines, Department of the Interior, at Seattle, Wash. The work is being done in co-operation with ceramic trade interests. Sillimanite is the normal silicate of alumina, containing 63 per cent. Al_2O_3 and 37 per cent SiO_2, and is also made artificially in the electric furnace. The best compound found is one a little richer in alumina than the pure sillimanite. One of the principal problems is the presence of impurities in the local clays that affect the fusing point. It was found that iron oxide present as impurity could be partly removed by reduction, but magnesia and lime could not be removed.

CHROMIUM

The only important ore of chromium is chromite or chrome iron ore. It is found in peridotite and in serpentine derived from peridotite. It occurs in irregular bunches, in vein-like masses, often mixed with magnetite. The discovery of masses of black, hard, heavy metallic mineral in serpentine or peridotite is not necessarily a find of chrome iron ore; it may be magnetite. On the other hand, chromite that is mixed with a little magnetite might be mistaken for magnetite.

Plant used for pulverizing limestone, consisting of a tower drier, disc feeder, air swept tube mills, cyclone separaters and bins. The product is 99.2% through 100 mesh, 94.8% through 150 mesh, and 84.5% through 200 mesh. Capacity, 11.8 tons per hour, and 137 H. P. required.

THE MINING DISTRICTS

By THE JOURNAL'S CORRESPONDENTS

NORTHERN ONTARIO

Porcupine. — The quarterly report of the McIntyre or the three months ending September 30th, shows a ubstantial increase in earnings. The gross recovery mounted to $681,000 and costs were $407,500, leaving operating profits of $273,500. Non-operating revenue was $19,500, and total profits, before taxes and depreciation, $293,000. Taxes for the period were $15,500, leaving net profits, before depreciation, of $277,500. For the fiscal year ending June 30th gross recovery was at the rate of $562,000 a quarter, and net earnings, before plant depreciation, $230,000 a quarter. It is rumored that negotiations are under way for the disposal of the balance of the McIntyre treasury shares to English interests. At the annual meeting it was intimated that in the comparatively near future the company might be faced with large expenditures to sink a new shaft to a depth of approximately 5,000 feet, and that funds for this purpose would have to be obtained by building up the surplus, thus deferring increased dividends, or by raising money by the sale of securities. If a deal were made for the stock in England, current earnings would be sufficient to justify increased dividends.

With the dividend cheques of $1.00 a share sent to shareholders, directors of the Dome advise that after November 14th share certificates should be sent to the Empire Trust Company, New York, in order to have them exchanged for new shares, on the basis of two new shares for each one of the old. The directors have no intention of making any further split-up at present.

Officials of the Porcupine Grande report that diamond-drilling has shown two ore-bodies, lying comparatively close together, and located in an area north of the underground workings. One body is stated to assay $11.00 over a width of 10 feet, and the other $44.00 across 7½ feet. The property is being developed by the Ontario National Development Company.

The West Dome Lake has cut its No. 2 vein, at a depth of 700 feet, where it shows a width of approximately 3 feet. The shaft will be continued to 1,000 feet, and a station will be opened at 750 feet.

The annual report of the Goldale Mines, which has been mailed to shareholders, holds out considerable encouragement for the future. At the annual meeting shareholders will be asked to ratify a by-law authorizing the directors to sell, option, lease or otherwise dispose of any of the Company's property. This is believed to be in connection with the proposed amalgamation of the Goldale, Plenaurum and Armstrong-Booth properties. Messrs. B. H. Westlake and F. M. Loper, Directors of the Kerr Lake Company, were elected to the Goldale Board.

The Premier Paymaster shaft has reached 600 feet, where a station is being cut, but sinking will be continued immediately to the 1,000-foot level. The property is being actively developed, and in addition to underground work, several diamond-drills are being used.

Kirkland. — During the month of September the Teck-Hughes Mine produced bullion of a value of $108,679, which constitutes a new record monthly output in the history of the Company. The mill treated 3,222 tons, having an average grade of $33.73 a ton. Development work is being done on five levels, and results are understood to be quite satisfactory.

The Wright-Hargreaves has recently been developing a new ore-body on the 550-foot level west of the main fault. The ore-shoot has been proven for a length of 300 feet, where it shows values of approximately $9.00 across a maximum width of 40 feet. This ore-body is particularly important, as it is the first commercial ore which has been found west of the fault, and an effort will now be made to open up the same ore-body on other levels.

The Sylvanite has encountered its best ore to date at the new 750-foot level, where a crosscut was run a short distance from the shaft. The shaft sinking is being continued to 875 feet, at which point it is understood that considerable development work will be undertaken.

Sinking has been continued on the Continental shaft, which was put down to a depth of 150 feet by hand. A complete new plant has been installed, and the shaft will be carried to a depth of 600 to 700 feet before any large amount of lateral exploration is undertaken.

The Hunton-Kirkland is crosscutting on the 375-foot level, and while no developments of importance have taken place, conditions are understood to be promising.

BRITISH COLUMBIA

Anyox. — The Granby Consolidated Mining and Smelting Co., in its policy of materially augmenting its ore reserves has been doing much important work this summer on the Outsider Group of mineral claims, Portland Canal. This was taken over from the Brown-Alaska Co., about a year ago and the results of development appear to give much encouragement. Surface and underground exploration has been kept steadily in progress. The plant and equipment available also are being renewed. There is a new dock, and the old ore bunkers have been put in shape to handle 1,000 tons of material a day. A new conveyor is ready to handle ore from the bunkers to the dock and the aerial gravity tram, constructed by the Riblet Tramway Co., of Spokane, is reported to be ready for operation. Electrical power has been provided by the construction of a 1,500-foot pipe line and this is to be supplemented by two Chicago pneumatic semi-Diesel engines. A large bunk house is planned and it is stated that the Company expects to be ready to commence shipments, at least up to 100 tons a day, some time before Christmas. Other properties in the same district are under option to the Company, the whole comprising some 27 mineral claims.

Construction of the building to house the Granby Company's new 1,500-ton concentrator at Anyox is being pushed forward actively as it is the desire to have the plant in operation before the end of the

year. The new plant is being placed on the hillside and is to be housed in a structure of concrete and steel.

Favorable Report on Portland Canal Properties. — B. W. W. McDougall, engineer for H. S. Denny, London, England, who bonded three mineral prospects in the Portland Canal District last July, has spent the summer season surveying the Salmon River zone of mineralization and, while on his way from the north, stated his conviction that the zone is of exceptional width with probability of great richness. On the latter point there was only the Premier Mine as a guide, but it was unreasonable to believe that in a highly mineralized area of such extent there is only one mine. Mr. Denny's properties are the Daly Alaska, the Bush and the Forty-Nine, on which a substantial sum has been spent this year. Mr. McDougall intimated that his report would favor the continuance of development.

"As to the district," Mr. McDougall said, "no one can make a mistake in going ahead. The country, perhaps, is somewhat difficult to operate in, but the geology is right for ore. I have been all the way from Georgia river through the Marmot, Bear and Salmon valleys up to Divide Lake and what impresses me most is the exceptionally wide area of mineralization.

"The Georgia river claims offer the most spectacular showings in the district. There is no place in the camp, or anywhere else in the Province that I know of, where one can get so many croppings that assay several hundred dollars gold to the ton. The fact that the ore is primary speaks well for its depth."

Regarding particular properties, Mr. McDougall mentioned the Dunwell on the Bear River as showing up well and the Fish Creek property as being one of the most advanced on the Salmon river side. The latter has excellent prospects of becoming an early shipper.

He had been through the Premier and, despite occasional reports to the contrary, the mine was holding up magnificently. "They are putting in two new 300 h.p. units of power in connection with the new tunnel being driven about 1,000 feet below the mill. This machinery is to be on the ground by the first of the new year."

Oil Stampede Well Regulated. — Dr. M. Y. Williams, of the department of geology in the University of British Columbia, recently delivered a lecture in the City of Vancouver on "Some Geological Discoveries in the North". After dwelling in detail on the early explorations in the Peace River territory and in the district lying along the northeastern border of British Columbia, he spoke of the finding of oil in that country by the Imperial Oil Co. Dr. Williams commended the enterprise of the Company in working so far ahead of the requirements of the oil industry. Oil had been proved in large quantities and could be developed when it became necessary. He congratulated the Federal Government on the plans that had been made to handle the threatened oil rush of the year 1921. Plans had been prepared for the erection of government offices for the recording of claims and strict regulations were made to prevent men lacking the required physical hardihood and knowledge from undertaking the journey. The result was that only men picked by the Royal Northwest Mounted Police were permitted to start and the tragedies which in the past almost invariably have accompanied stampedes to distant and little known districts were thus avoided.

Enlarged Hydro-Electric Plant. — The West Kootenay Power & Light Co., which furnishes power and light to the plant of the Consolidated Mining and Smelting Co., and which supplies most of the other industries of the east and southern parts of the Province, as well as towns and larger communities with their electrical needs, is enlarging its plant at Bonnington Falls, near Nelson. The productive capacity of the plant is practically being doubled.

Kaslo. — A satisfactory understanding having been reached with stockholders, Col. H. H. Armstead is speeding up work at the Utica Mine near Kaslo. The mining plant is being put in shape for a winter of uninterrupted development. It is said that the acquisition of other properties adjoining the Utica is contemplated and that Col. Armstead hopes to build up the largest mining enterprise of the Slocan.

Prospect Sold. — The Maple Leaf Mine, Franklin Camp, Boundary district, was sold at private sale recently to Thomas Dunlap, of Chesaw, Wn., for $4,000. The Maple Leaf Co. made an assignment some weeks ago to Dennis St. Dennis, of Nelson. It is stated that the mine has been developed to the shipping stage and is considered one of the promising prospects of the camp.

Trail Ore Receipts. — Ore receipts at the Trail Smelter, Consolidated Mining & Smelting Co., of Canada, for the first week of October totalled 4,496 tons. The detailed shipments follow:

	Tons
Alamo, Alamo	99
Company Mines	3,635
Cork Province, Zwicky	95
Galena Farm, Silverton	41
Knob Hill, Republic Wn.	152
Quilp, Republic Wn.	108
Rambler, Rambler	8
Silverton, Sandon	283
T. H. Pidduck, Alice Arm	36
Washington, Rambler	39
	4,496

NOVA SCOTIA

Advantages of Merger. — It is little more than three years since all the large coal fields of Nova Scotia were linked up together under the British Empire Steel Corporation. The Sydney district was then the largest producer, just as it is now. But the collieries of this district were much hampered in their development, and the outputs were kept down by boundary disputes between the two largest coal companies of Nova Scotia. Frequent attempts had been made by the heads of governments and others interested to settle the matter without success. It was, therefore, with great acclaim that the general public and the towns most affected hailed the news of the amalgamation which was to set aside the quarrel between the rival companies. Coal outputs had begun to decrease and the combined daily output of these two large companies only amounted to about 12,000 tons a day. It is only fair to state, however, that the war played quite a factor in helping to restrict the output, although the boundary question, gave very serious trouble.

Daily Production Climbing

The Corporation once organized, changes were made in the colliery management. District Superintendent

A. S. MacNeil was transferred from Sydney Mines to become General Superintendent at Glace Bay, over all the Cape Breton collieries. He took with him as his assistant, D. H. McLean, manager of one of the oldest collieries in Nova Scotia, and possibly in Canada. Manager J. R. McNeil was promoted to the position of District Superintendent at Sydney Mines and a number of other changes were made. The wisdom of bringing the two large companies together, under an able staff, began to be felt at once, but is more clearly seen today, when we are in a position to compare outputs. The Sydney Mines daily outputs rose from a little over 2,000 tons to 3,400 tons, and the Glace Bay collieries increased from 10,000 to almost 17,000 tons. This has been all accomplished in the short period of three years. Taking into consideration the fact that the development of nearly all collieries barely kept pace with mine production during the war, and that very little machinery could be brought in, the progress that has been made is very marked indeed. Probably the labor troubles that came as an aftermath of the war affected the outputs more than anything else. But to add more than 50 per cent. to the coal output in three years, in the face of these troubles during which time three collieries were closed down and only one opened up, required men of high intelligence, trained minds, great driving force and untiring industry. It has been accomplished, however, and no matter how we look at it, the work done stands to the credit of all who had part in it. The different superintendents, namely A. McDonald, J. J. McNeil, and P. T. Prendergast, are all men of large experience, good practical mining men and keen students of their profession who are eager to learn and who have the power of application.

New Collieries to Raise Output

One large colliery has stood idle for over two years on the advice of a British mining engineer brought over to advise on submarine areas. Another big colliery will be ready to take its place among the producers early in the coming year. But the work of these two collieries, when in operation, will be partly offset by the reduced production of some of the older collieries. All things considered, the Nova Scotia collieries are in line to give largely increased outputs.

Record of 1923 Will Be Reached Before 1926

Looking back to the year 1913, when a maximum daily output of 20,000 tons were obtained, it will be remembered that Mr. F. W. Gray made a statement that the output would not again reach that amount for many years. This has been verified; but we are again on the verge of halcyon days, and if the outputs increase during the next three years in proportion to the three years just passed, we shall again be reading of new high records. There is little doubt that the 20,000-ton mark will be passed long before the end of 1926.

NOVA SCOTIA COAL PRODUCTION

Coal production from mines of the Dominion Coal Company this year will show quite a substantial increase over 1922 and to the end of September, the output is within a month's tonnage of what it was for the whole of last year. For the year 1922 the total production was 2,845,000 tons, and for the nine months' period of this year the output was 2,527,000 tons. The total shipments for 1922 were 2,400,000 tons, and for the nine months of the present year were 2,340,000 tons.

ALBERTA

Conciliation Board's Decision at Drumheller. — A decision has been given by a Conciliation Board, appointed by the Federal Minister of Labor to arbitrate disputes between employers and employees in the coal field of Drumheller, Province of Alberta, which is of importance, not by reason of the case immediately at issue, but because of the fundamental principle involved, viz., the right of the employer to hire and dismiss for cause that appeals to him as good and sufficient without being compelled to suffer outside coercion.

"The matter in dispute arose from the refusal of the Hy-Grade mine to give employment to James Conroy, the former claiming that under the agreement with the miners, the mine owners had the management of the mine, and the right to hire and discharge the workers in the mine; James Conroy claiming that under the agreement he was entitled to a preference of employment as he had been employed in the mine previous to its closing down for the summer, and should, when the mine again began operation, be given employment in preference to new men who had not worked previously in the mine.

"It appears from the evidence submitted before me that James Conroy was employed in the Atlas mine in 1919 and 1920; in the Hy-Grade mine during a portion of 1921; and in the Elgin mine for a portion of 1921; all of which mines are situated in the Drumheller district. He also was a member of the board of miners of the United Mine Wokers of America from December 1921 to the 22nd day of September, 1922, when he again took employment with the Hy-Grade mine, where he was employed as a miner till April 3rd, 1923, when the output of the mine for the summer was curtailed, and Conroy, without any fault on his part, was let out and paid off. He is a married man and with his wife and two children resided in Drumheller for some years and he resides there now.

"About the 1st of July, 1923, the mine resumed partial operations and Conroy presented himself at the Hy-grade mine and asked for employment, but was refused work, the mine company taking the position that under the contract with the miners the company had the right to employ whomsoever they thought fit, basing its position on the following clause in the agreement:

> **Management of the mine:** — The right to hire and discharge, the management of the mine and the direction of the working forces are vested exclusively in the company, and the United Mine Workers of America shall not abridge that right.

"Conroy took the position that under the agreement, where the mines closed down or where a miner was laid off without any fault on his part on account of suspension of work, on resumption of work at the mine he should be given preference to new men, and that new men should not be taken on at the mine while the old men who formerly worked at the mine were willing to come back, and he based his position on the following clause in the agreement:

> **Preference of employment:** — In case an employee is thrown out of employment, unless discharged, he shall be given preference over new men in other mines in the same camp operated by the same company.

"The Hy-Grade mining company took the position that this clause in the agreement did not apply to the Hy-Grade mine, as this mine operates only one colliery and only one mine or opening at that colliery; that this clause in the agreement applied only to companies that operated more than one colliery and more than one mine at each colliery; that this applied to mines of the Crow's Nest Coal Company which operated mines at Coal Creek, Michel, and had several mines or openings at each of those places; but that this was not the condition of the Hy-Grade mine.

"The evidence on behalf of Conroy shows that when he learned that new men were employed in the mine he went to Mr. McConkey, the managing director, and asked for employment, when he was told by McConkey that there was no place for him at the mine, and that he did not intend to employ him.

"From the evidence of McConkey and Harry Crowder, mine manager, it appears that Conroy, before the time he applied to the managing director for work and before any new men were taken on at the mine, went to the mine manager, Harry Crowder, and asked for employment and when he was told there was no work for him he became very abusive, calling the mine manager vile names and using obscene language; the manager at the hearing stating that the language used by Conroy at the time was so vile and filthy that he could not repeat it, and that Conroy took off his coat and approached the mine manager in a threatening attitude, saying that he 'would lick him and give the mine all the trouble he could, that he would go the limit unless he was taken back to work.' This disturbance took place in the presence of twelve employees of the mine.

"Neither Conroy nor his representatives at the hearing denied the happening of this episode as described, but claimed that Conroy's attitude towards the mine manager was caused by his hearing that new men were employed in the mine in preference to him, and that he became indignant and threatened the mine manager when the mine manager claimed that no new men were taken on.

"The managing director in his evidence stated that the conduct on the part of Conroy as shown in his menacing and threatening attitude towards the mine manager had a tendency to create discord and trouble among the workers in the mine and to disorganize and disarrange the working therein, that it would be detrimental to the interest of the owners and shareholders of the mine to employ Conroy, who threatened to do bodily harm to the mine manager and damage to the mine property.

"Under the clause of the agreement cited — 'Management of the Mine' — it is clear that the company has the right to hire and discharge and are responsible for the management and working of the mine.

"To my mind the clause cited — 'Preference of Employment' — and relied on by Conroy must be read with the clause 'Management of the Mine', which gives the right to the company to hire and discharge, and this clause is not varied or changed by the subsequent clause 'Preference of Employment,' so as to compel the company to employ someone who would be detrimental to its interests, as the evidence here discloses.

"Under the evidence introduced at the hearing I do not believe that Conroy has made out a case to compel the company to give him employment in the mine and this is my finding."

(Signed) "James Smith, Chairman."

INVESTIGATION OF MINERAL FILLERS

The investigation of the availability of certain minerals for use as fillers, together with a study of their physical and chemical characteristics, and their adaptability to commercial uses, is being continued by the Department of the Interior, through the Bureau of Mines. The South has extensive deposits of clays, ochres, bauxite, talc, graphite, etc., and the purpose of this study is to determine their value for use as fillers in making linoleum, paper and other commercial products.

The laboratory study of the size and character of grains of non-metallic mineral fillers has been completed. The results show that these characteristics have an important bearing on the applicability of a mineral filler and the types of manufactured products in which it can be used.

Laboratory work on Georgia and Alabama white clays to determine their value for filler use has been completed. The samples investigated included 31 Georgia and 11 Alabama clays. Of the Georgia clays, 17 were selected for more extended semi-commercial tests, and 500-pound samples were sent to the Ceramic Experiment Station of the Bureau of Mines at Columbus, Ohio, for washing, pulverizing and dispatching to the manufacturers who are co-operating in the factory tests. The laboratory tests have shown that a number of the Georgia clays tested are equal or superior in quality to the imported foreign clays now largely used in the paper trade. The bureau's tests also indicate the clays are of value in rubber filling, and rubber manufacturers are being furnished with samples of the Georgia clays, to test their value in rubber compounding.

DOLOMITE FOR REFRACTORIES

Research work on the utilization of dolomite in refractories is being continued by the Ceramic Experiment station of the Bureau of Mines, Columbus, Ohio. The main problem being studied is to combine the lime in the dolomite so that it will be non-slaking and at the same time hold up the refractories, thereby rendering available abundant deposits of dolomite for extensive use as a basic refractory. Work previously done by the Bureau of Mines on different fluxes for rendering dolomite refractories non-slaking indicated that by careful selection and preparation, refractory bricks could be made, one of the best fluxes tried being alumina-iron flux. More recent work done by the bureau consisted of slaking time tests on varying proportions of dolomite mixed with an alumina-iron flux. The proportion of flux to dolomite was varied between 5 and 20 per cent. The refractory properties as well as the slaking tendency of these mixes was studied. After the best proportion of flux to ground rock was determined, bricks were made by the soft mud and dry press processes, using both organic and inorganic binders. Then methods of firing to produce sound bricks were studied. As a result, a composition has been found which, when compounded with the proper binder and burned after a given procedure, produces a strong, non-slaking brick of high refractoriness. The

bricks are satisfactory in every respect, except that uniform shrinkage has not been completely attained. During the coming year, bricks will be produced and tried out in the industry.

LOSS OF GASOLINE BY EVAPORATION

The use of cooling systems in vapor-tight tanks should serve as a means of checking evaporation losses of gasoline which amount annually to 3 to 4 per cent of the stocks accumulated during the winter season and whose value runs into millions of dollars, says Serial 2531 of the United States Bureau of Mines, now available to the public.

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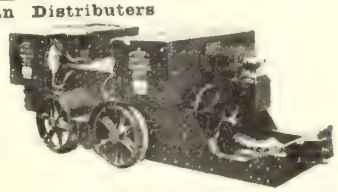

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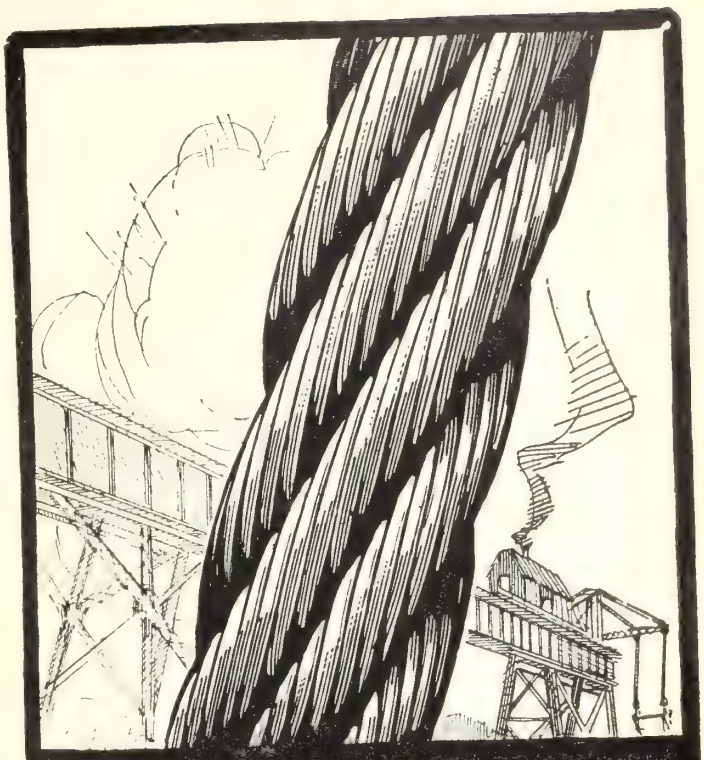

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Department of Colonization, Mines and Fisheries

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The Mining Law gives absolute security of Title and is very favourable to the Prospector.

MINER'S CERTIFICATES. First of all, obtain a miner's certificate, from the Department in Quebec or from the nearest agent. The price of this certificate is $10 and is valid until the first of January following. This certificate gives the right to prospect on public lands and on private lands, on which the mineral rights belong to the Crown.

The holder of the certificate may stake mining claims to the extent of 200 acres.

WORKING CONDITIONS. During the first six months following the staking of the claim, work on it must be performed to the extent of at least twenty-five days of eight hours.

SIX MONTHS AFTER STAKING. At the expiration of six months from the date of the staking, the prospector, to retain his rights, must take out a mining license.

MINING LICENSE. The mining license may cover 40 to 200 acres in unsurveyed territory. The price of this license is Fifty Cents an acre per year, and a fee of $10.00 on issue. It is valid for one year and is renewable on the same terms, on producing an affidavit that during the year work has been performed to the extent of at least twenty-five days' labour on each forty acres.

MINING CONCESSION. Notwithstanding the above, a mining concession may be acquired at any time at the rate of $5 an acre for SUPERIOR METALS, and $3 an acre for INFERIOR MINERALS.

The attention of prospectors is especially called to the territory in the North-Western part of the Province of Quebec north of the height of land, where important mineralized belts are known to exist.

PROVINCIAL LABORATORY. Special arrangements have been made with POLYTECHNIC SCHOOL of LAVAL UNIVERSITY, 228 ST. DENIS STREET, Montreal, for the determination, assays and analysis of minerals at very reduced rates for the benefit of miners and prospectors in the Province of Quebec. The well equipped laboratories of this institution and its trained chemists ensure results of undoubted integrity and reliability.

The bureau of Mines at Quebec will give all the information desired in connection with the mines and mineral resources of the Province, on application addressed to

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Aggregate Value of $734,259,619

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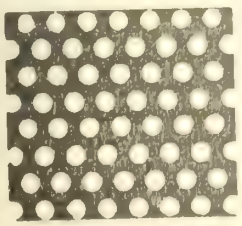

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Canadian Ingersoll-Rand Co., Ltd.
Denver Rock Drill Mfg. Co.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Laurie & Lamb.
Smart-Turner Machine Co.
Peacock Brothers, Limited.

Concentrating Tables:
Herbert, Alfred, Limited.
Holman Bros., Ltd.
The Mine & Smelter Supply Co.

Concrete Mixers:
Canadian Fairbanks-Morse Co., Ltd.
Gould, Shapely & Muir Co., Ltd.

Condensers:
Canadian Ingersoll-Rand Co. Ltd.
Belliss & Morcom, Ltd.
Laurie & Lamb.
Peacock Brothers, Ltd.

Condensers — Electrical Static & Power:
Griswold & Co.

Consulters and Engineers:
Milton Hersey Co., Ltd.

Conveyors:
Link-Belt Limited.
Canadian Mead-Morrison Co.
Jones & Glassco (Regd.).

Conveyor Belts:
Canadian Fairbanks-Morse Co., Ltd.
Gutta Percha and Rubber, Ltd.

Conveyor Flights:
Hendrick Manufacturing Co.

Conveyor — Trough — Belt:
Dodge Manufacturing Co.
Link-Belt Limited.
Hendrick Mfg. Co.
Jones & Glassco, Regd.

Copper:—
Consolidated Mining & Smelting Co.

Countershaft Fixtures:
Dodge Manufacturing Co.

Couplings:
Dodge Manufacturing Co.
Hans Renold of Can., Ltd.

Cranes:
Link-Belt Limited.
Canadian Mead-Morrison Co.
Peacock Brothers, Limited.

Crane Ropes:
Allan Whyte & Co.
Canada Wire & Cable Co.
Greening B., Wire Co., Ltd.

Crucibles:
The Mine & Smelter Supply Co.

Crusher Balls:
Canada Foundries & Forgings, Ltd.
Herbert, Alfred, Limited.
Holman, Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
Peacock Brothers, Limited.
The William Kennedy & Sons, Ltd.

Crusher Jaws:
Canadian Steel Foundries, Ltd.
The William Kennedy & Sons, Ltd.

Crushing Rolls:
Canadian Steel Foundries, Ltd.
The William Kennedy & Sons, Ltd.

Crushers — Jaw & Gyratory:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
Lymans, Limited.
The Mine & Smelter Supply Co.
Hadfields, Limited.

Cut Gears:
Hans Renold of Can., Ltd.
Jones & Glassco, Regd.
The William Kennedy & Sons, Ltd.

Cyanide:

Cyanide Plant Equipment:
The Dorr Co.
The Mine & Smelter Supply Co.
Diamond Drill Contractors:
Smith & Travers
Sullivan Machinery Co.

Diesel Engines:
Belliss & Morcom, Ltd.
Canadian Fairbanks-Morse Co., Ltd.
Laurie & Lamb.
Lammers & Maase, Ltd.

Dies:
Canada Foundries & Forgings, Ltd.
Herbert, Alfred, Limited.
Hull Iron & Steel Foundries, Ltd.
Holman Bros., Ltd.
Dredging Ropes:
Allan Whyte & Co.
Greening, B. Wire Co., Ltd.

Dredges:
Canadian Mead-Morrison Co.

Dredger Pins:
Hull Iron & Steel Foundries, Ltd.

Dredging Machinery:
Hadfields, Limited.
Hull Iron & Steel Foundries, Ltd.

Drills — Air and Hammer:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Herbert, Alfred, Ltd.
Holman Bros., Ltd.
Sullivan Machinery Co.
The Mine & Smelter Supply Co.

Drills — Core:
Canadian Ingersoll-Rand Co., Ltd.
Herbert, Alfred, Limited
Holman Bros., Ltd.
Sullivan Machineery Co.

Drill Steel Furnaces:
Canadian Ingersoll-Rand Co., Ltd.
Denver Rock Drill Mfg. Co.
Herbert, Alfred, Limited
Holman Bros., Ltd.
Sullivan Machinery Co.

Drills — Diamond:
Sullivan Machinery Co.
Drill Steel — Mining:
Canadian Ingersoll-Rand Co., Ltd..
Hadfields, Limited
Mussens, Limited
Drill Steel Sharpeners:
Canadian Ingersoll-Rand Co., Ltd.

Drills — Electric:
Canadian Fairbanks-Morse Co., Ltd.
Herbert, Alfred, Limited
Holman Bros. Ltd.
Sullivan Machinery Co.
Northern Electric Co., Ltd.
Drills — High Speed and Carbon:
Canadian Fairbanks-Morse Co., Ltd.
Hadfields, Limited
Herbert, Alfred, Limited
Holman Bros, Ltd.
Ejectors:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Electric Condensers:
Griswold & Co.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Herbert, Alfred, Limited
Holman Bros., Limited
Northern Canada Supply Co.
Electric Hoists:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Mead-Morrison Co.
Elevators:
Dodge Manufacturing Co.
Canadian Machinery Co.
Sullivan Machinery Co.
Link-Belt Limited.
Northern Canada Supply Co.
Hadfields, Limited.
Jones & Glassco (Regd.)
Engineering & Surveying Instruments:
Laurie & Lamb
Engines — Ventilating:
Canadian Sirocco Co., Ltd.
Engines, Diesel:
Canadian Fairbanks-Morse Co., Ltd.
Bellis & Morcom Ltd.
Laurie & Lamb
Lammers & Maase, Ltd.
Engines — Gas and Gasoline:
Canadian Fairbanks-Morse Co., Ltd.
Belliss & Morcom, Ltd.
Sullivan Machinery Co.
Gould, Shapely & Muir Co., Ltd.
Laurie & Lamb.
The Mine & Smelter Supply Co.
Powley & Moody, Limited.
Engines — Haulage:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd
Powley & Moody, Limited.
Engines — Steam:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Laurie & Lamb.

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Dresser, John A.
Dorr Co.
Ferrier, W. F.
Hore, R. E.
Heyes & Sons, Thos.
Hersey Co. Ltd., Milton
McEvoy, James C.
Rogers, George R.
Ross, Jas. G.
Stewart, Robert H.
Tyrell, J. B.
Whitman, Alfred B.
Wilson, Ridgeway R.

Exhauster:
Canadian Sirocco, Ltd.

Ferro-Alloys (all Classes):
Canadian Steel Foundries, Ltd.

Fire Fighting Supplies:
Canadian Fairbanks-Morse Co., Ltd.
Gutta Percha & Rubber, Ltd

Flood Lamps:
Northern Electric Co., Ltd.

Flotation Oil:
Hercules Powder Co.

Fluorspar:
Consolidated Mining & Smelting Co.
Everitt & Co.

Forging:
Canada Foundry & Forging, Ltd.
Herbert, Alfred, Limited
Holman Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
Smart-Turner Machine Co.

Friction Clutches:
Canadian Fairbanks-Morse Co., Ltd.
Dodge Manufacturing Co.

Frogs: — See Switches & Turntables
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Hull Iron & Steel Foundries.
John J. Gartshore.

Furnaces — Assay:
Lymans, Limited.
Mine & Smelter Supply Co.

Gasoline Extraction Compressors:
Canadian Ingersoll-Rand Co., Ltd.
Sullivan Machinery Co.

Gasoline Tanks — See Tanks:
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Horton Steel Works, Ltd.
Hendrick Manufacturing Co.

Gaskets:
Gutta Percha & Rubber, Ltd.

Gears:
Hans Renold of Canada, Ltd.
Jones & Glassco, Regd.
The William Kennedy & Sons, Ltd.

Gears (Cast):
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The William Kennedy & Sons, Ltd.
Hull Iron & Steel Foundries, Ltd.

Gears: Machine Cut:
The Hamilton Gear & Machine Co.
The William Kennedy & Sons, Ltd.

Gold Refiners:
Goldsmith Bros.

Gold Pans:
Can. Chi. Bridge & Iron Works, Ltd.
Horton Steel Works, Ltd.

Grab-Buckets:
Canadian Mead-Morrison Co.

Hangers:
Canadian Fairbanks-Morse Co., Ltd.
Dodge Manufacturing Co.

Hose:
Canadian Fairbanks-Morse Co., Ltd.
Goodyear Tire & Rubber Co.
Gutta Percha & Rubber, Ltd.
Dunlop Tire & Rubber Co.

Hangers and Cables:
Stan. Underground Cable Co., Ltd.

Heating Systems:
Canadian Sirocco Co., Ltd.

High Speed Steel:
Hadfields, Ltd.

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Canadian Ingersoll-Rand Co., Ltd.
Canadian Rock Drill Co.
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Dodge Manufacturing Co.
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Holman Bros., Ltd.
Jones & Glassco, Regd.
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Peacock Bros., Ltd.
Sullivan Machinery Co.

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Hoppers:
Dodge Manufacturing Co.

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Hadfields, Ltd.
Belliss & Morcom, Ltd.
Laurie & Lamb.
The William Kennedy & Sons, Ltd.

Industrial Chemists & Inspectors:
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Insulating Compounds:
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Northern Canada Supply Co.

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Northern Electric Co.
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Consolidated Mining & Smelting Co.

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Magnesium Metal:
Hull Iron & Steel Foundries, Ltd.

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Metal Merchants:
Consolidated Mining & Smelting Co
C. L. Constant Co.

Metallurgical Engineers:
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Metallurgical Machinery:
Dwight & Lloyd Sintering Co.
The Dorr Co.
The Mine & Smelter Supply Co.

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Hendrick Manufacturing Co.
The William Kennedy & Sons, Ltd
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Mica:
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Powley & Moody, Limited.

Mining Engineers:
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Powley & Moody, Limited.

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Mine Surveying Instruments:
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Motors:
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Peacock Brothers, Ltd.
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Motor Pulleys:
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Dodge Manufacturing Co.

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The Mond Nickel Co., Ltd.

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Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd.

Oil Storage Tanks — See Tanks:
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Horton Steel Works, Ltd.
Hendrick Manufacturing Co.
The Toronto Iron Works, Ltd.

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Link-Belt Limited.
Canadian Mead-Morrison Co.
Herbert, Alfred, Limited.

Ore Sacks:
Northern Canada Supply Co.

Ore Testing Works: See Assayers & Chemists:

Ores & Metals—Buyers & Sellers of:
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Consolidated Mining & Smelting Co
Everitt & Co.

Oils:
Hercules Powder Co.

Pavers:
Wettlaufers Brothers.
Gutta Percha & Rubber, Ltd
Laurie & Lamb.

Perforated Metals:
Hendrick Mfg. Co.
Greening, B. Wire Co.

Pillow Blocks:
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Canadian Link-Belt Co., Ltd.

Pipes:
Canadian Fairbanks-Morse Co., Ltd
Consolidated Mining & Smelting Co
The William Kennedy & Sons, Ltd

Pipe — Wood Stave:
Pacific Coast Pipe Co.
Mine & Smelter Supply Co.
Canadian Ingersoll-Rand Co., Ltd.

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Plate Works:
Canada Foundry & Iron Co. Ltd
Hendrick Mfg. Co.
The William Kennedy & Sons Ltd
Hamilton Steel Works, Ltd

Platinum Refiners:
Goldsmith Brothers

Pneumatic Tools:
Canadian Fairbanks-Morse Co. Ltd
Canadian Ingersoll-Rand Co. Ltd
Holman Bros., Ltd.

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Canadian Fairbanks-Morse Co. Ltd
Canadian Ingersoll-Rand Co.
Sullivan Machinery Co.

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Greening, B. Wire Co., Ltd.

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Canadian Westinghouse Co.

Power Condensers:
Canadian Westinghouse Co.

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Mine & Smelter Supply Co.

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Canadian Fairbanks-Morse Co., Ltd
Dodge Manufacturing Co.
The William Kennedy & Sons Ltd

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Canadian Ingersoll-Rand Co., Ltd

Pulverizers — Laboratory:
Herbert, Alfred, Limited
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Pumps — Pneumatic:
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Canadian Ingersoll-Rand Co., Ltd
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Sullivan Machinery Co.

Pumps — Steam:
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Canadian Ingersoll-Rand Co., Ltd
Northern Canada Supply Co.
Peacock Brothers, Ltd.
Smart-Turner Machine Co.

Pumps-Turbines:
Canadian Fairbanks-Morse Co., Ltd
Smart-Turner Machine Co.
Canadian Ingersoll-Rand Co., Ltd
Laurie & Lamb.
Canadian Sirocco Co., Ltd

Pumps-Vacuum:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd
Smart-Turner Machine Co
Canadian Sirocco Co., Ltd.

Pumps — Better Feed:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd
Canadian Sirocco Co., Ltd.

Pumps — Centrifugal:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd
Laurie & Lamb.
Peacock Brothers, Limited
Smart-Turner Machine Co.

Pumps — Diaphragm:
Canadian Fairbanks-Morse Co., Ltd
The William Kennedy & Sons, Ltd

Pumps — Electric:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd
Laurie & Lamb.
Peacock Brothers, Ltd.
Smart-Turner Machine Co

Pumps — Sand & Slime:
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Canadian Ingersoll-Rand Co., Ltd
Laurie & Lamb.
Mine & Smelter Supply Co
Sylvester Mfg. Co., Ltd.

Pumps — Valves
Canadian Fairbanks-Morse Co., Ltd
Peacock Brothers Ltd

Push Cars — See Cars, Push:
Powley & Moody, Limited.

Quarrying Machinery:
Canadian Ingersoll-Rand Co., Ltd
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Sullivan Machinery Co.

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Dodge Manufacturing Co.

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Hadfields, Limited.
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Powley & Moody, Limited.

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Goldsmith Brothers

Riddles:
Hendrick Mfg. Co.

Rod Mills:
Mine & Smelter Supply Co.

Roll Shells:
The William Kennedy & Sons, Ltd.
Canadian Steel Foundries, Ltd.

Rolls — Crushing:
Canadian Ingersoll-Rand Co., Ltd.
Hadfields, Limited.
Hull Iron & Steel Foundries, Ltd
Herbert, Alfred, Ltd.
Holman Bros. Ltd.
Wettlaufer Bros.

Roller Chain:
Hans Renold of Canada, Ltd.
Link-Belt Limited.
Jones & Glassco, Regd.

Rope — Manilla & Jute:
Dodge Manufacturing Co.
Jones & Glassco, Regd.
Allan, Whyte & Co.

Rope — Wire:
Canadian Fairbanks-Morse Co., Ltd.
Anglo Canadian Wire Rope Co.
Allan, Whyte & Co., Ltd.
Canada Wire & Cable Co.
Canada Wire & Iron Goods Co.
Dodge Manufacturing Co.
Dominion Wire Rope Co., Ltd.
Greening, B. Wire Co.

Rope Transmission Equipment:
Dodge Manufacturing Co.

Saline Refiners:
Goldsmith Brothers.

Samplers:
Canada Metal Co.
Ledoux & Co.
Milton Hersey Co.
Thos. Heyes & Son.
Mine & Smelter Supply Co.

Screens:
Canadian Ingersoll-Rand Co., Ltd.
Greening, B. Wire Co.
Hendrick Mfg. Co.
Canada Wire & Iron Goods Co.

Screens — Cross Patent Flanged Lip:
Hendrick Mfg. Co.

Screens — Perforated Metal:
Hendrick Mfg. Co.

Screens Shaking:
Link-Belt Limited.
Hendrick Mfg. Co.

Screens — Revolving:
Link-Belt Limited.
Hendrick Mfg. Co.
The William Kennedy & Sons, Ltd.

Separators:
Smart-Turner Machine Co.
Mine & Smelter Supply Co.

Se er Pipes:
Wettlaufer Bros.

Shafting:
Canadian Fairbanks-Morse Co., Ltd.
Dodge Manufacturing Co.

Sheet Metal Work:
Hendrick Mfg. Co.

Sheaves:
Dodge Manufacturing Co.

Sheets — Genuine Manganese Bronze:
Hendrick Mfg. Co.

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Peacock Brothers, Ltd.
The William Kennedy & Sons, Ltd.

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Canada Foundries & Forgings,

Sleeves:
Dodge Manufacturing Co.

Sintering:
Dwight & Lloyd Sintering Co., Inc.

Smelters:
Goldsmith Bros

Smoke Stacks:
Can. Chicago Bridge & Iron Co., Ltd.
Horton Steel Works, Ltd
Hendrick Mfg. Co.
The William Kennedy & Sons, Ltd

Special Machinery:

Spelter:
The William Kennedy & Sons, Ltd.
Consolidated Mining & Smelting Co.

Sprockets:
Canadian Fairbanks-Morse Co., Ltd.
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Canadian Fairbanks Morse Co., Ltd.
Dodge Manufacturing Co.
Link-Belt Limited.
Jones & Glassco, Regd.
The William Kennedy & Sons, Ltd.

Spring Coil & Clips Electric:
Canadian Steel Foundries, Ltd.

Stamp Batteries:
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Holman Bros., Ltd.

Stamp Forgings:
Canada Foundries & Forgings, Ltd
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Steel Barrels:
Smart-Turner Machine Co.

Steel Castings:
Canadian Steel Foundries, Ltd.
Canadian Brakeshoe Co., Ltd.
Hull Iron & Steel Foundries, Ltd.
Hadfields, Ltd.
The William Kennedy & Sons, Ltd.
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Sullivan Machinery Co.
Peacock Brothers Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Canadian Mead-Morrison Co.

Steam Hoisting Engines:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Mead-Morrison Co.

Steel Drums:
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Steel Manganese:
Hadfields Ltd.
Hull Iron & Steel Foundries Ltd.
Canadian Steel Foundries, Ltd.

Steel Plate Construction — Light and Heavy:
Hendrick Mfg. Co.
The William Kennedy & Sons, Ltd.

Steam Engines — See Engines Steam:

Steam Traps:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Sirocco Co., Ltd.
Laurie & Lamb.

Steel-Tool:
N. S. Steel & Coal Co.
Hadfields, Limited.

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Stone Quarrying Machinery:
Canadian Ingersoll-Rand Co., Ltd.
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Sullivan Machinery Co.

Structural Steel Work — Light:
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Sulphate of Copper:
The Mond Nickel Co., Ltd.

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C. L. Berger.

Switches:
Canadian Steel Foundries, Ltd

Tables — Concentrating:
Mine & Smelter Supply Co.

Tanks:
Hendrick Manufacturing Co.

Tanks — A[illegible]:
Hendrick Manufacturing Co.
Ontario Wind Engine & Pump Co

Tanks — Wooden:
Gould, Shapley, & Muir Co., Ltd.
Ontario, Wind Engine & Pump Co.
Pacific Coast Pipe Co., Ltd.
Mine & Smelter Supply Co.

Tanks, Cyanide, Etc.:
Hendrick Mfg. Co.
Ontario Wind Engine & Pump Co.
Pacific Coast Pipe Co.

Tanks — Steel:
Canadian Ingersoll-Rand Co., Ltd.
Hendrick Mfg. Co.
The William Kennedy & Sons, Ltd.

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Track, Manganese Steel:
Canadian Steel Foundries, Ltd.

Trackworks — (Manganese-Steel):
Hull Iron & Steel Foundries, Ltd.
Canadian Steel Foundries, Ltd.

Tramway Points & Crossings:
Hadfields, Limited.

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Northern Electric Co., Ltd.

Transmission Appliances:
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Hans Renold of Canada, Ltd.
Jones & Glassco, Regd.
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Tubs:
Hadfields, Limited.
Powley & Moody, Limited.

Tube Mills:
Canada Foundries & Forgings, Ltd.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
The William Kennedy & Sons, Ltd.
Mine & Smelter Supply.

Tube Mill Balls:
Canada Foundries & Forgings, Ltd.
Holman Bros., Ltd.
Herbert, Alfred, Limited.
Hull Iron & Steel Foundries, Ltd.
Peacock Brothers, Ltd.
The William Kennedy & Sons, Ltd.

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The William Kennedy & Sons, Ltd.

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Laurie & Lamb.
Herbert, Alfred, Limited.
Hull Iron & Steel Foundries, Ltd.
Peacock Brothers, Ltd.
The William Kennedy & Sons, Ltd.

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Canadian Fairbanks-Morse Co., Ltd
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Everitt & Co.

Vacuum Pumps — see Pumps, Vacuum:

Ventilating Systems:
Canadian Sirocco Co., Ltd.

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Canadian Fairbanks-Morse Co., Ltd.
The William Kennedy & Sons, Ltd.

Water Jet Drifting Drill:
Canadian Ingersoll-Rand Co., Ltd.
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Dodge Manufacturing Co.

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Winches — Power Driven:
Canadian Fairbanks-Morse Co., Ltd.
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Canadian Fairbanks-Morse Co., Ltd.
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Standard Underground Cable Co. of Canada, Limited.

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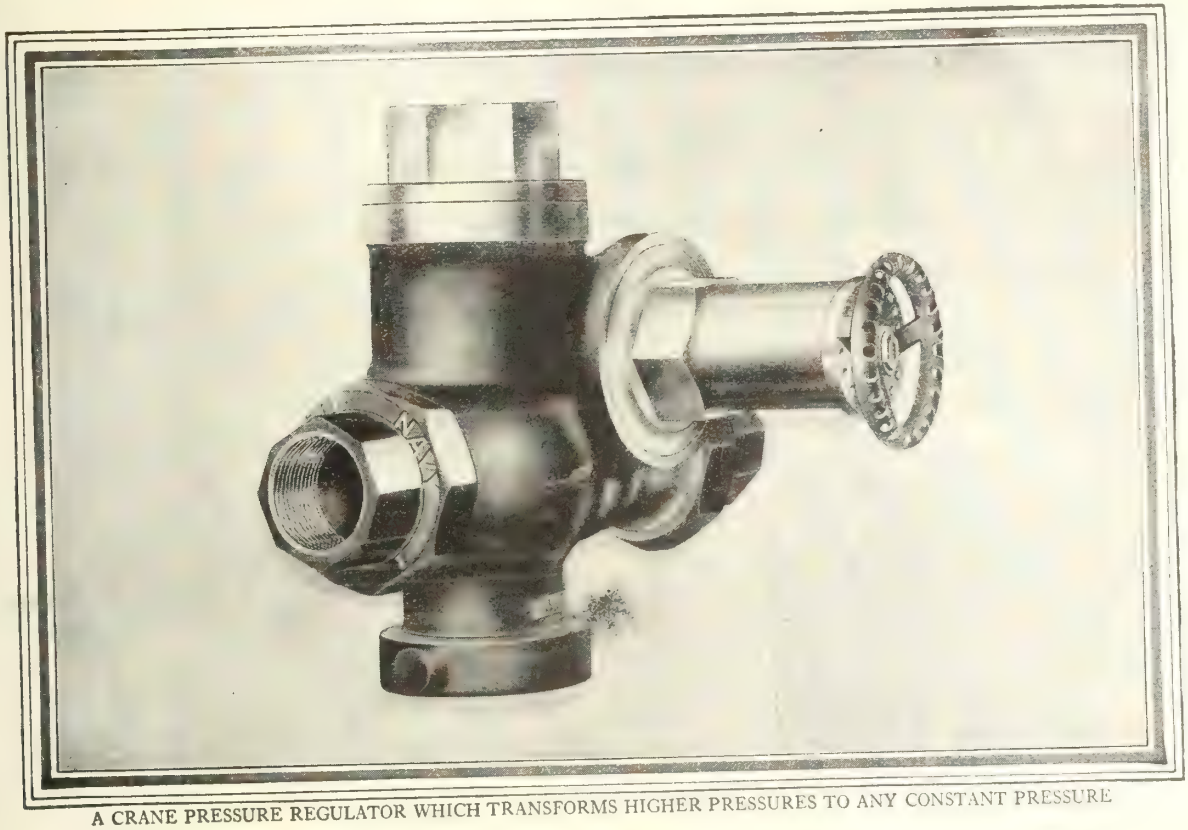

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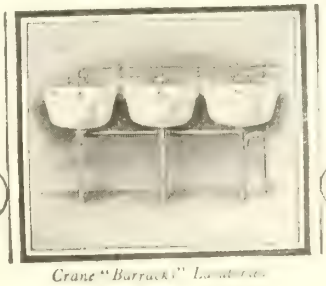

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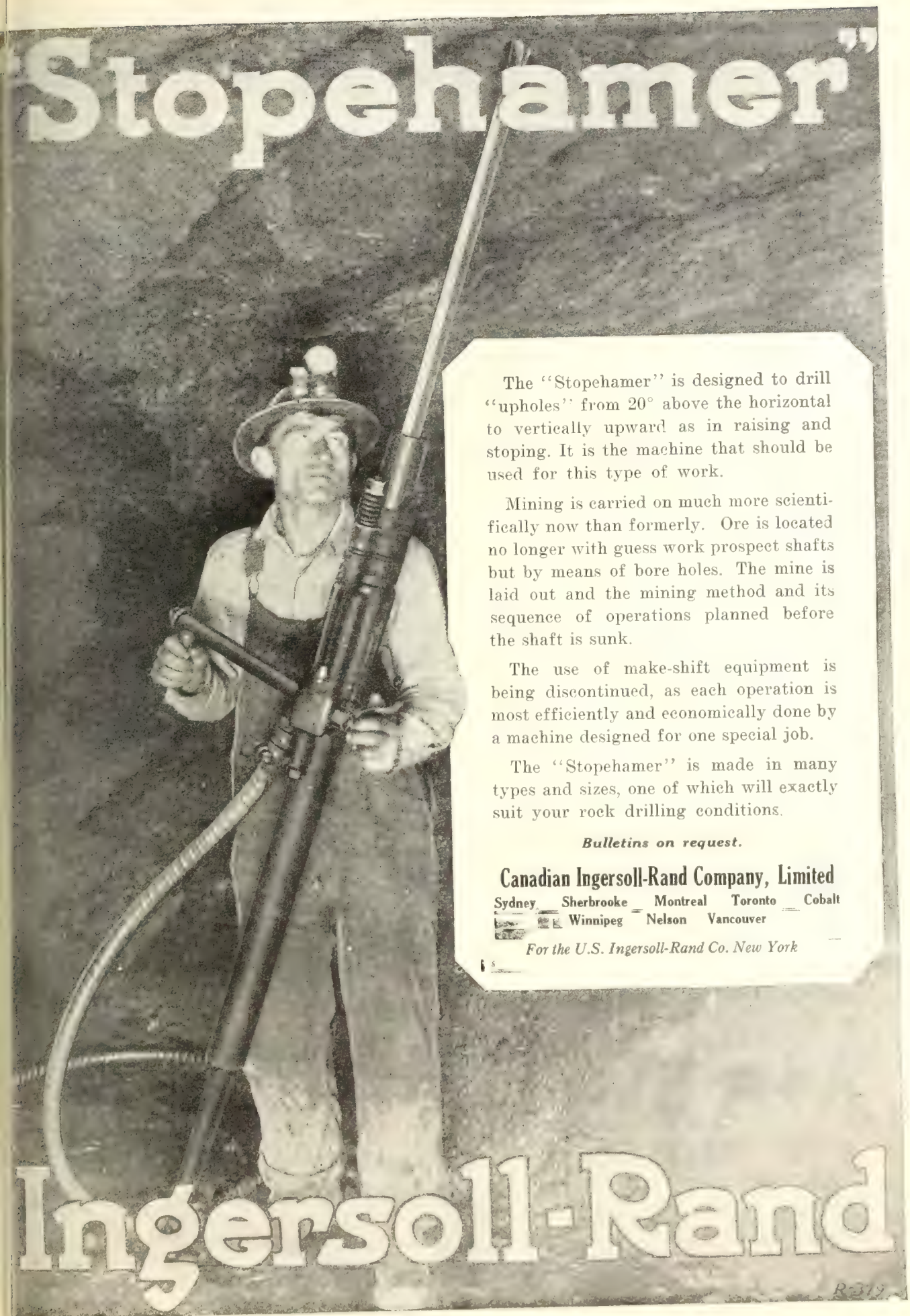

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PROVINCE OF ONTARIO

Hon. CHARLES. McCREA, Minister. DEPARTMENT OF MINES *Thos. W. Gibson*

Mineral Areas

Ontario, with its 407,262 square miles, contains many millions of acres in which the geological formations are favourable for the occurrence of minerals 70 per cent of the area being underlain by rocks of pre-Cambrian age. The phenomenally rich silver veins of Cobalt, Gowganda and South Lorrain occur in these rocks; so also do the far-famed nickel-copper deposits of Sudbury, the gold of Porcupine and Kirkland Lake, and the iron ore of Magpie and Moose Mountain mines.

Economic Minerals

In addition to the above, practically all economic minerals coal and tin excepted are found in Ontario: — actinolite, apatite, arsenic, asbestos, cobalt, corundum, feldspar, fluor spar, graphite, gypsum, iron pyrites, lead, mica, molybdenite, natural gas, palladium, petroleum, platinum, quartz, salt, talc and zinc. This Province has the largest deposits on the continent of talc, feldspar, mica and graphite.

Building materials, such as ornamental marble, limestone, sandstone, granite, trap, sand and gravel, lime, Portland cement, brick and tile, meet every demand.

Mineral Production

Preliminary returns show the output of the mines and metallurgical works of the Province for the year 1922 to be worth $62,202,169, of which the metallic production was $38,190,711.

The following figures show the growth of Ontario's mineral industry by five year periods since 1891 when a Bureau of Mines was first established.

Year.	Value.	Year.	Value
1891	$4,705,672	1911	$41,976,797
1896	5,235,003	1916	65,303,822
1901	11,831,086	1918 (Maximum war output)	80,308,972
1906	22,388,383	1921	48,128,387

Dividends and bonuses paid to the end of 1922 amounted to $28,096,699 for gold mining companies, and $86,238,185 for silver mining companies or a total of $114,334,884

Mining Regulations

A miner's license costs $5.00 per annum, and entitles the holder to stake out in any or every mining division three claims of 40 acres each. After performing 200 days' assessment work on a claim, patent may be obtained from the Crown on payment of $2.50 or $3.00 per acre, depending on location in unsurveyed or surveyed territory.

Assay Office

The Provincial Assays Office at No. 5 Queen's Park, Toronto, is maintained by the Department of Mines for the free identification of minerals, free assays under the provisions of the Mining Act of Ontario, and also for general assay work as per the Schedule of Charges which may be obtained on application.

Temiskaming Testing Laboratories

The Department maintains, at Cobalt, an ore sampling and testing laboratory which is now prepared to receive parcels of gold ore from 100 pounds upward, and after sampling and assaying the same to pay to the shipper the value thereof, less treatment charges. The purpose is to afford a market for ores extracted by prospectors and others in developing their mining claims, enabling them to obtain funds which they can use for further work and to report on the most satisfactory method of treatment. Fuller information may be obtained on application to the Manager, Temiskaming Testing Laboratories, Cobalt, Ontario.

Publications

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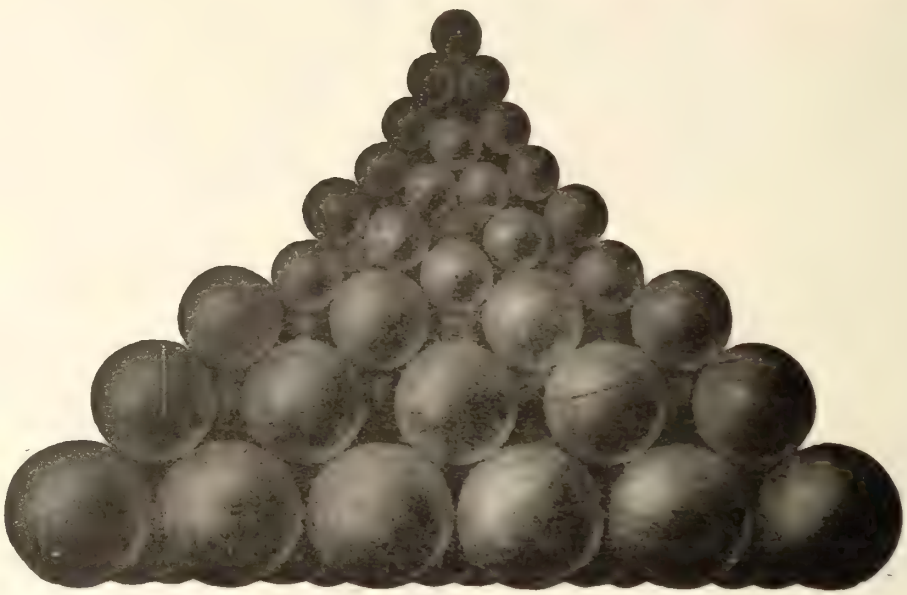

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CANADIAN MINING JOURNAL

PUBLISHED WEEKLY

Devoted to the Science and Practice of Mining, Metallurgy and the Allied Industries; and more particularly to their progress in Canada

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The Editor cordially invites readers to submit articles of practical interest which, on publication, will be paid for.

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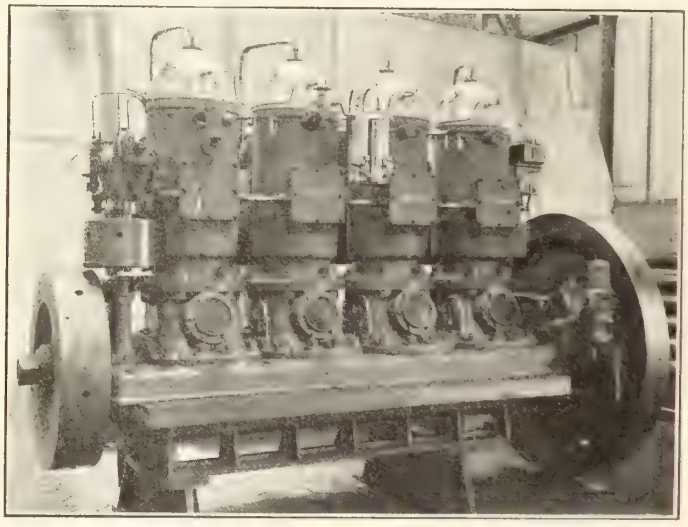

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:-: EDITORIAL :-:

THE EMPIRE COUNCIL OF MINING AND METALLURGICAL SOCIETIES

Ir. Hugh F. Marriott, past President of the Insti- on of Mining and Metallurgy, was entertained at ner by the British Columbia Division of the Cana- n Institute in Vancouver on Oct. 29th., and thus imenced a tour of Canada upon his important mis- n under the most auspicious conditions.

Ir. Marriott is touring the Empire as the official resentative of the Institution of Mining and Me- urgy and the Institute of Mining Engineers to can- s opinion of a project that is of vital moment to engineering professions.

Much has been written of late of the increasing need scientific methods in all branches of mining and tallurgical work, and it has been conceded that the ue of technical training and experience can hardly overestimated. Greater and greater demands are de upon the engineer, who is expected to absorb, intensive study and devotion to his life work, the ts and theories upon which to form judgments that ll be of value to others; but what has been done to sure to the engineer the justly-earned fruits of his rifice and training? So far nothing has been done. cieties are formed through the medium of which he y still further exploit his knowledge. By means of ir transactions he can make public his discoveries, d can derive such satisfaction as is to be found in sociation with his fellows.

Although attempts have been made, and in some ses have served to a limited extent to give protec- n to the members of a Society in such manner as is ustrated by the Law Societies of the legal profes- n, it has been increasingly manifest that the indi- dual engineer is, in the main, left unaided in the ndication of his position and in determining the size his fee or salary; and from the very nature of his lling, he suffers a serious disadvantage thereby.

A very real difficulty in the establishment of any ntral organization to cope with this situation is the verse nature of the mining engineer's practice and ie ramifications of the profession as a whole. The rofession at its beginning years ago may be likened a young tree supporting its tender shoots. From at we have arrived at a stage where the fully de- loped branches form an important and integral part f the whole, and dominate it's very character. It ould be obviously an act of unwisdom to attempt to npose restrictions, standards or penalties upon the eedom of such branches' natural growth.

In the proposal that Mr. Marriott is submitting to the members of the profession throughout the Empire, this difficulty has been overcome, and a plan is outlined by which, while preserving absolute freedom of action to sister Societies, a coöperative means is provided for preserving the integrity and strengthening the influence of the mining and metallurgical professions. Briefly, the plan is to form an Empire Council of Mining and Metallurgical Societies composed of representatives from all the established organizations throughout the British Empire, which shall be empowered to establish a Register of Engineers according to such high standards of repute and efficiency as it may deem to be expedient. According to this proposal, it is not incumbent upon the affiliated societies to modify their own regulations or standards in conformity with the requirements of the Register; but on the other hand, it is conceivable that the influence of such societies may be greatly enhanced by their participation in the activities of a united profession thus stabilized in the eyes of the world. , ,

We accord our heartiest support to this movement and note with satisfaction that a resolution in favor of it was passed unanimously by the Vancouver members of the British Columbia divison of the Canadian Institute of Mining and Metallurgy, at this, Mr. Marriott's first meeting in Canada.

Mr. Marriott was able to tell his audience that the suggestion had been accepted with enthusiasm in Australia, and we trust and believe that no less cordial a reception awaits him in this country. We may add, in assurance of our appreciation of the personal effort entailed, that his world-wide tour upon this mission to engineers is of itself an inspiration.

MORE TECHNICAL OFFICERS FOR QUEBEC BUREAU OF MINES

Hon. J. E. Perrault has authorized the appointment to the technical staff of the Bureau of Mines at Quebec of two mines inspectors and one or more mining geologists. He has thus acted promptly in fulfilling the promises recently made that the mining industry in his province would receive more adequate consideration from the Government of which he is a member.

One mines inspector has been appointed already, and is on duty at Thetford Mines. He is Mr. Eugene Larochelle, who graduated from the Ecole Polytechnique of the University of Montreal in 1916 with degrees in civil and mining engineering. Since graduation he has been employed at the Bell Asbestos Mines, where

he had charge recently of all the engineering work. Mr. Larochelle entered upon his new duties on October 15th. In addition to the inspection of the asbestos mines from the standpoint of the safety of workmen, he will act as assessor for the collection of the royalty on asbestos.

For years past Mr. T. C. Denis, Superintendent of Mines at Quebec, has said both publicly and privately that a gold boom in the province would result in the rehabilitation of his long neglected Bureau. He has proved to be a true prophet; and we are sure that from now on the Quebec Bureau of Mines and the province's mining industry will receive from the political administrators of the province the attention and the consideration that are its due.

HOLLINGER RESEARCH FELLOWSHIP

During the last two years a scientific research has been in progress in the laboratories of the department of mining engineering of the University of Toronto with a view to determining the essential qualities of various crushing mechanisms, particularly of ball mills. Some of the results have been published in a series of papers by H. E. T. Haultain and F. C. Dyer, a striking feature being the "movie" pictures showing the action and paths of the balls in ball mills. The design and construction of the special apparatus required for these researches has involved a considerable expenditure of money. The Ontario Department of Mines and the Advisory Research Council have contributed to the good cause funds that have enabled the researches to make the special tube mill apparatus and to buy the requisite "movie" camera, and to build a special set of rolls and an integrating dynamometer wherewith to attack another phase of the crushing problem.

This research work is expensive, and not the least expense is the "keep" of the researcher—though few researchers ask for more than a decent living. Hollinger Gold Mines, Limited, have come to the rescue. They have presented to the University a fellowship amounting to $1,200, which is to be given to the Hollinger Research Fellow for nine months' work on the problem of crushing. The fellowship has been awarded to Mr. H. F. Farncomb, B.A.Sc., of Trenton, Ont.

The management of Hollinger have spent a good deal of time and money on an investigation of the crushing problem during the last year or two by comparing the efficiencies of the various mechanisms available. This work has, no doubt, brought home to them as never before the meagre basis of fact upon which our ideas about crushing are based, and the crying need for an understanding of the principles involved. A fortunate outcome of the research they have now subsidised will return the investment many fold, not only to themselves but to the whole world of mining men. In the hands of Professor Haultain and his able staff it is bound to be a good investment. Hollinger's example might well be followed by othe of our wealthy mining corporations. The history research in our universities shows a manifold retu for the comparatively small sums expended by the

THE QUALITY OF PUBLICITY

The hearty reception accorded to Mr. C. M. Cam bell at the Trail meeting of the Institute when he rea his paper on "Publicity in the Mining Industry" si nified more than a mere appreciation of his coura in advocating the cause of unwelcome truth. The me ing admitted the truth, and several members expres ed their opinion of the need for a broader understan ing of how the mining industry can best state its ca to the public. Stripped of all personalities, the di cussion that has engaged the attention and interest the members of the Institute for some months past r solves itself into a consideration of the merits of tw points of view, both of which should be deemed as fa removed from the domain of philosophical reflectio as they are beyond the scope of the meticulous stat tician.

The extremes of these divergent points of view u hold the free and unrestricted use of inductive an deductive powers in the outlining of possibilities the one hand, and the ultimate dominance of col facts on the other hand. The application of thes points of view to the problem of publicity in mine matters brings one face to face with two oppos interests that in the very nature of commercial rela tions must be always, in their essentials, as separat as the poles, — the interests of vendor and purchase To coördinate these interests is one of the minin engineer's chief functions. A man who is led by a unbridled imagination does not deserve to be call an engineer, any more than does a man who devot himself solely to academic facts and yard-stic definitions.

The Institute represents the mining engineering pr fession in Canada, and it is therefore appropriat that the trend of publicity, as it affects the relatio between people with properties to sell and those wit money to invest, should be scrutinized closely by its members.

Some may be of the opinion that it had been bette not to raise this issue publicly. We are not of tha school. We welcome the opportunity to say that our mining industry requires the assistance neither of the visionary nor of the disinterested gentleman who sell near-mines on commission. The ideal of the mining engineer will always be to formulate his conclusions with due regard to known facts, and at the same time to include as much of the future as sound judgment and a well-rounded experience will allow. To stat determinable facts does not exhaust the prerogative of the mining engineer; to make himself fully useful he must use these facts to build up in his mind's eye a sane and logical picture of the future. We hold to

e middle way that will neither wreck mining pro-
cts and dissipate capital because of blind confidence
the future, nor will discourage investment and
ock progress because of a lack of vision.

RICE-CUTTING IN WINNIPEG COAL CONTRACTS

The Winnipeg School Board recently awarded the ntract for 9,000 tons of bituminous coal to a local ealer who supplied Pocahontas coal for $9.70 per n, in competition with Alberta coal, which could t be sold profitably in Winnipeg at that price. In e October issue of *Western Canada Coal Review*, r. Geo. R. Pratt, Fuel Engineer to the Government Alberta, discusses this award, and shows that the merican producer who provided this coal is doing at a loss, with a view to holding the Winnipeg arket against the smaller and financially weaker mine perators in Canada.

Mr. Pratt states that the cost of this coal, delivered Winnipeg, is $9.98 per ton; therefore it is being sold a loss. However, the American organization that trying to hold the Winnipeg market is very large. nd to it this temporary loss is the merest trifle.

The School Board of Winnipeg have got some heap coal this year. There is no assurance that this w price will be continued; in fact it is certain that will not be continued. This instance illustrates the ell-known means whereby a large and financially trong company eliminates the competition of a maller rival by a temporary price-cutting campaign. t is doubtful if, in the long run, the customer reaps permanent advantage from the temporary lowering f prices; the successful competitor is sure to make im pay up for the losses incurred.

When the price-cutting involves international trade nother factor is introduced; a part of our national mmercial independence is at stake. In this case the bject of the American coal company is clearly to oosen the hold of the miners of Alberta on the Win-ipeg market. We were warned at the Institute meet-ngs in Montreal last spring by a representative of the American producers that they would lower their prices n order to retain their Canadian markets. Can we Canadians afford to let the "coal barons" of the United States play with the markets in this country? Most we sit back and see the coal operators of Alberta excluded from contracts because their rivals are pre-pared to sell coal for a time at a loss? Is the effort to provide to the utmost Canadian coal for Canadians to be thwarted by the scheme of an American corpora-tion? Mr. Pratt says "no," and many Canadians will agree with him. The long-sighted view is that the market for Alberta coal must be extended to the economical limit, and no juggling with prices should be allowed to interfere with this natural expansion.

As there is no law to prevent school boards or any other public body or individual from buying cheap coal, whatever the circumstances, and as there cannot well be any such law, it is clearly a case in which recourse must be had to the pressure of public opinion. We heartily commend Mr. Pratt's efforts on behalf of the Alberta coal operators, and hope he and others interested in Canadian fuels will gain the fullest measure possible of public support.

INSTITUTE BY-LAWS MISINTERPRETED

In the *Engineering and Mining Journal-Press* of October 27th, Mr. T. A. Rickard gives some pungent and well merited criticism of the form of recent by-laws adopted by the Canadian Institute of Mining and Metallurgy. When he discusses the matter and the intent of these by-laws, however, he appears to go astray. On the basis of the prerogative of Council to admit to membership "such other persons as shall be otherwise eligible in the opinion of Council," and to associateship "such other persons as the Council may decide to be eligible through connection with mining affairs." Mr. Rickard argues that the Institute is fated to become "nondescript in character" and heterogeneous in membership.

While we shall not attempt to defend the English of the new by-laws, we must point out that Mr. Rickard has misinterpreted completely their import. They are the result of a well-organized movement among Western members of the Institute to effect an object the direct opposite of that stated in the present interpretation. These members believe that the Institute cannot fulfil its principal functions satisfactorily until its members take more seriously the responsibilities of their membership. They have acted vigorously on the basis of this belief, their first move being a revision of the defined status of membership with a view to requiring of new members a higher technical status and to inculcating in old members a more adequate sense of their responsibility to the Institute. The stated intention is to make the Institute more exclusive, rather than to include men on the outskirts of the profession as Mr. Rickard suggests.

On numerous occasions before this by-law was passed we discussed both its merits as a practical measure and the ultimate object its proponents wish to attain. The by-law is now an accomplished fact and so requires no further discussion. The object of those who framed and then worked for the new regulation is entirely worthy and deserves the hearty support of the whole Institute. Our own opinion is that the by-law itself can have comparatively little effect one way or the other on Institute activities. Mere words on the printed page will not count for much; something more vital is required. If the individual members will put their shoulders to the wheel, the Institute will immediately commence to move forward to the position of national influence and importance that is its rightful place.

A Symposium on British Columbia Metallurgy

Descriptions of Plants and Processes at Trail, Anyox and Britannia given at the Trail Meeting of the Institute

By H. G. NICHOLS

The Executive Committee of the British Columbia Division of the Canadian Institute of Mining and Metallurgy has to its credit the assembling of the notable series of papers presented at the Trail meeting last month. It was at Mr. Mortimer-Lamb's suggestion that this opportunity was taken for the simultaneous publication of the facts relating to the mining and metallurgical problems and operations of the three most important technical developments in British Columbia at this time.

The response to this invitation on the part of the Consolidated M. & S. Co. of Canada, the Granby M. S. & P. Co. and the Britannia M. & S. Co. Ltd. exceeded expectations. Particularly in the case of the first named corporation, the symposium prepared by Mr. S. G. Blaylock and his staff, in it's wealth of detail and the frankness with which it discussed problems mastered and methods of treatment adopted, evinced a breadth of view and generosity of purpose that have produced a profound impression in the Province, and has laid, once and for all, the bogey of secret processes in connection with the treatment of complex lead-zinc ore.

The following is a summary of the information laid before the members of the Institute by the officials of the respective corporations.

Trail Practice

The research work of the Consolidated M. & S. Co of Canada, looking to a solution of the problem of treatment, assumed a definite objective with the assurance of a supply of ore of a more or less uniform grade from its Sullivan mine. This ore contains about,

10% lead
12% zinc
32% iron.

Fuming and magnetic separation processes were tried for some time, but were discarded in 1920 in favour of flotation and leaching with the use of the reagents, soda ash, cyanide and copper sulphate, to give selected products. By the addition of cyanide to the crushed ore to the approximate amount of 1/10 lb. cyanide per ton of ore, a differential flotation in favour of the lead mine is produced that gives a concentrate averaging.

65.70% lead
4.5 % zinc
6. % iron

The effect of the cyanide in holding down the zin then neutralized by the addition of copper sulphate, in a subsequent flotation operation a zinc concentrat obtained that averages,

41 % zinc
3.5% lead
17 % iron

The lead concentrate is shipped by rail to the plant Tadanac for treatment first by sintering and roasting the Dwight and Lloyd process, and then by smelting electrolytic rrefining.

The zinc concentrate is treated in the new plant Kimberley, which occupies a floor area of 73,500 squ feet, is 600 feet long and has a total installed po plant of 4,000 H. P. for all purposes outside of crush The crushing plant runs for 8 hours only, 355 H. P. ing installed for coarse, and 390 H. P. for fine crush The total capacity of the plant is 3,000 tons of ore d

The Zinc Plant

The process, which was described at length and ill trated by flow sheets and diagrams, may be simply cribed as follows:

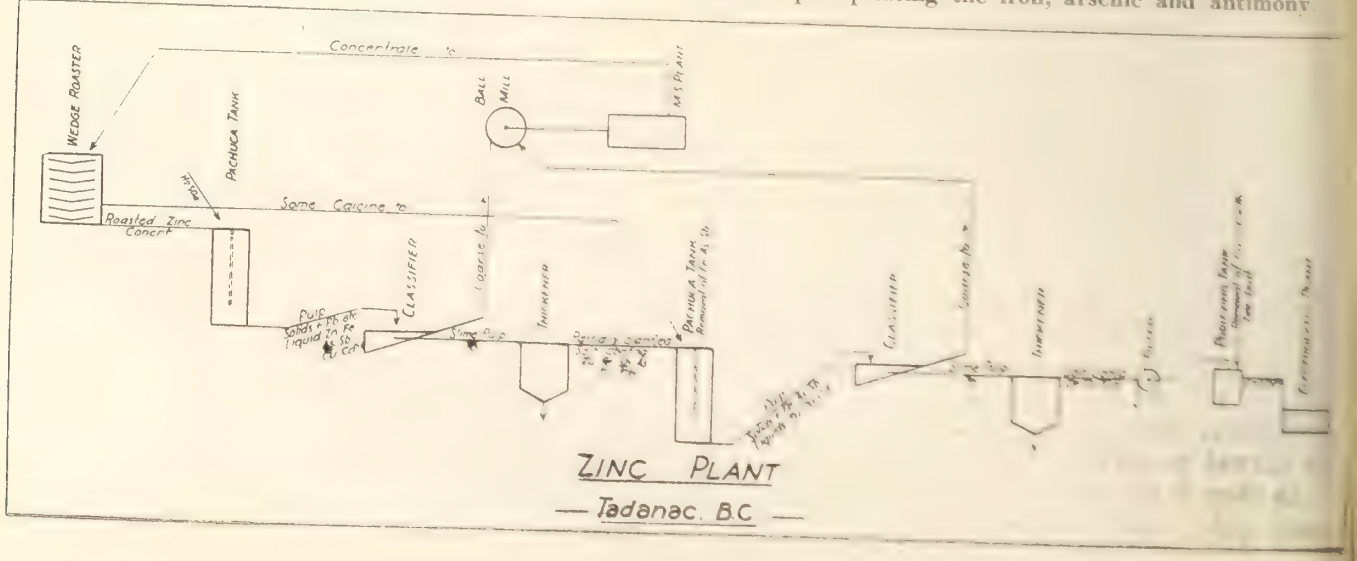
The concentrate is roasted in Wedge furnaces

The calcine is treated with sulphuric acid in Pach tanks.

The mixed pulp is passed through classifiers to remo coarse material. This coarse material is re-ground in b mills, passed through a flotation plant, and the con trate returned to the roaster.

The slime pulp is passed through thickeners for ra separation of solid and liquid.

The solution, containing zinc, iron, antimony, arse copper and cadmium, is passed to a second series Pachuca tanks, where a fresh portion of the calcine f the roaster is added, the zinc oxide in which has the effect of precipitating the iron, arsenic and antimony



The pulp is passed through classifiers and thickeners as in the previous stage, and the solution carrying the zinc, copper and cadmium is clarified in Kelly filters.

The clear solution is treated in purifying tanks with atomized zinc dust; the copper and cadmium are thus precipitated and the pure zinc sulphate solution is passed to the electrolytic plant.

The accompanying diagram represents the process graphically.

The Granby Operations

The principal points of Mr. Clapp's paper on Granby practice were as follows:

The Granby is mining and smelting directly in blast-furnaces about 3,000 tons daily of a massive pyritic copper ore which carries about 2 per cent copper and from 30 to 50c per ton in gold and silver.

Nearly 15 million tons of ore have been developed, in seven ore-bodies. The total value in copper, gold and silver in these ore-bodies is about $75,000,000. There are two types of deposit: First, there are massive pyrite ore-bodies lying at a contact between intrusive greenstone and argillite, which Mr. Clapp describes as having the appearance of tadpoles, with the head pointed upwards against the overhanging argillite roof, and the tail stringing off down the contact and feathering out. The cores of these lenses are normally of higher grade than the outside; an ideal cross-section would show an envelope of silica surrounded by a variously thick band of pyrite, and in the centre, a core of a higher grade mixture of pyrite and chalcopyrite. Second, there are impregnations of chalcopyrite and pyrrhotite along joint planes in the greenstone.

The hypothesis when the property was opened up was that there were approximately equal quantites of these two classes of ore and that they supplemented one another to the extent that, when mixed with some coke and a little limestone, they would smelt economically. It was found, however, that there was not enough free silica in the ore, and as depth was attained, this very necessary constituent gradually disappeared from the greenstone ore-bodies of the second class. To make matters worse, the inclusion of a considerable amount of dyke rock with the ore became unavoidable, more limestone and silica had to be added to the furnace charge, and then the pro portion of the greenstone ore-bodies had to be cut down. This threatened a position where many million tons of ore in these economically unsmeltable bodies would be left, after the pyritic bodies had been exhausted.

A typical analysis of this greenstone ore is as follows:

Insoluble	42.25%
Silica	35
Iron	24
Lime	4
Sulphur	16
Alumina	9
Magnesia	5

New Mill for Flotation Concentrate

Experiments in concentrating this material were begun It was not sufficient to remove the silicate minerals alone, it was necessary to have a concentration that would remove the pyrrhotite as well, and selective flotation was tried. The experiments were successful and a flotation unit of 1,000 tons is now being installed.

A further possibility, indicated by tests made by the Consolidated M. & S. Co., is that the pyrite can also be eliminated by means of differential flotation, and if this proves to be the case, it may be possible to treat the whole output from both classes of ore-body in this way and to discard direct smelting altogether.

The situation that would then be developed is very signficantly expressed in Mr. Clapp's own words. He says: "If there were tonnage enough to justify the installation, and if the subsequent smelting of the concentrates should not prove too expensive, our present system of direct smelting would then be obsolete, and Anyox would become a camp of concentrating mills and reverberatory furnaces. Unfortunately, the problem is not so simple. Our present known tonnage will hardly justify the cost of a reverberatory plant and we have a number of custom ore shippers whose product could not well be handled with the reverberatories. Unless then, we can find some cheap method of smelting flotation concentrates with our present equipment, we must continue to treat at least a portion of our tonnage by pyritic smelting.

Proposed Methods of Smelting Concentrate

"There may be some way in which the flotation concentrate can be handled advantageously in a blast furnace. Several methods have been suggested and are under consideration.

"The first, that of mixing the concentrate with the flue dust and sintering it on the Dwight and Lloyd machine, is simple but expensive and would probably entail some sort of Cottrell dust treatment for the sintering plant as well as for the blast-furnaces.

"A second possibility involves blowing the dried concentrate through either the blast furnaces or the converter tuyeres, which is metallurgically sound, but I fear mechanically weak.

"A third proposal involves feeding the concentrates directly into the mouth of the converters in the same manner as siliceous flux is now fed, accepting a certain high dust loss, which would be caught in the dust chamber and by Cottrells. This would presuppose sufficient molten matte coming from the blast furnaces to liquify the flotation concentrates, or the concentrates can be fused in an electric furnace before adding to the converters.

Another scheme, and perhaps the wildest of the lot, has been to mix the concentrate with a certain amount of coal and make coke from the mixture in our regular by-product coke ovens. Results from experimental work on this have been excellent so far as the resulting coke product is concerned. It takes on the consistency of carborundum and stands hard usage excellently. The only difficulty in the scheme so far found is that, to make a proper mixture, it takes almost twice as much coke as concentrate. In other words, if our ore were all reduced to flotation concentrate, we would have to run on a 200 per cent coke ratio.

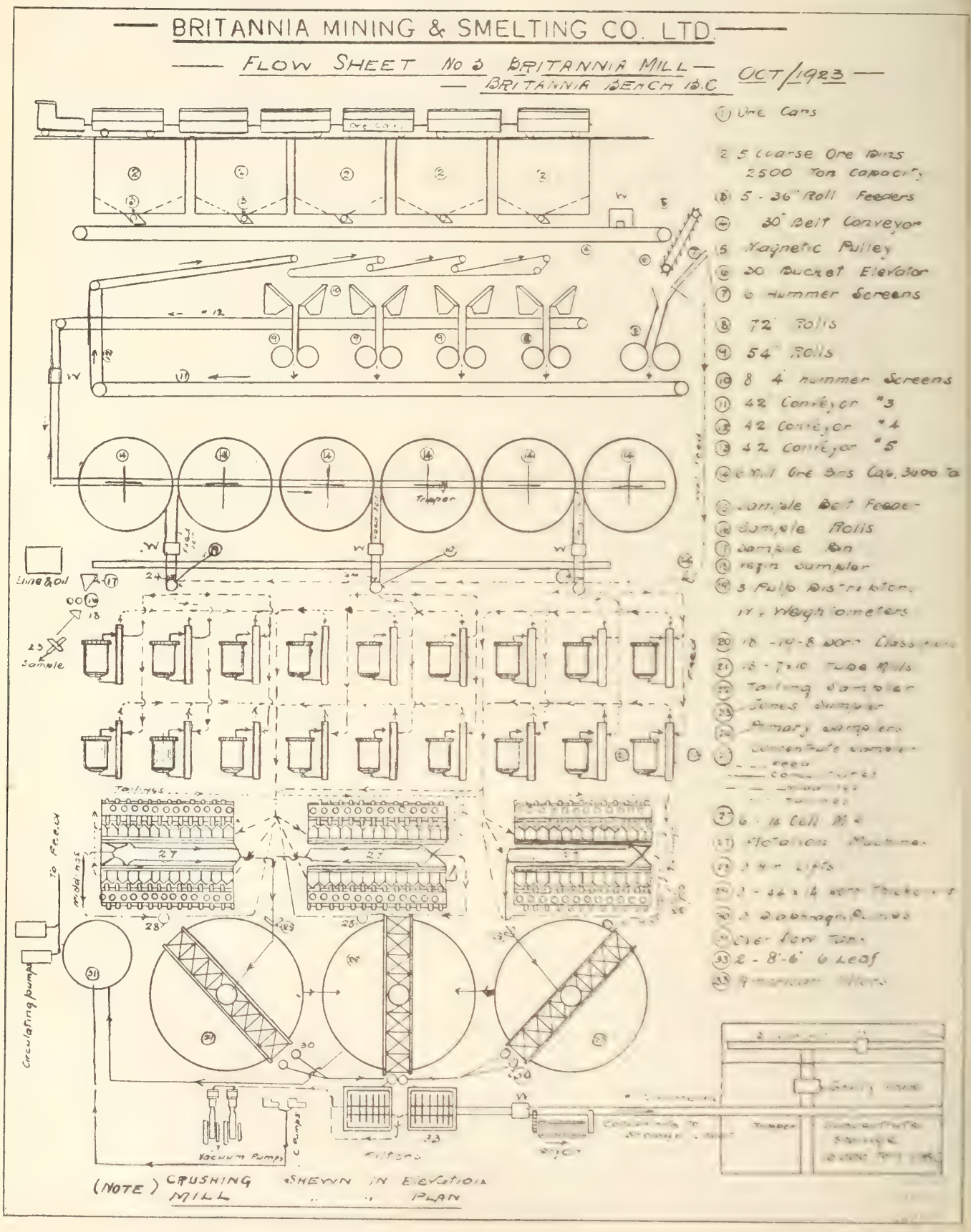
"All these schemes are being investigated, and it may be that a way can be found to handle flotation concentrate in a blast furnace as cheaply and as effectively as low-grade ore. If so, we can then either mine out our ore-bodies at a considerably higher rate of speed or we will have a large amount smelting capacity for custom ores."

The Britannia Treatment

M. A. C. Munro's paper on "Milling Practice at the Britannia Mines" brought out the salient features of this case very clearly. The problems connected with the Britannia ore have always been distinguished from those of the Granby, although the general grade of copper content is practically identical in both cases. The attractions towards direct smelting practice that have been noted in the one case, are entirely lacking in the other. Economic treatment of the Britannia ore has been recognized as being dependent upon efficient concentration. An important factor in this connection is the favourable location on tidewater that allows the reverberatory plant at Tacoma to be used to advantage.

There are distinct characteristics of the Britannia ore that distinguish it from that of the Hidden Creek mines. The ore occurs in schistose, silicified derivatives of quartz and diorite porphyries, in which pyrite and chalcopyrite constitute 17% of the total weight. Due to the almost complete silicification, very little colloidal material results from fine grinding, and the schistose structure promotes greater efficiency in crushing than in the case of the Granby ore, which breaks in large flat pieces.

The whole problem of the Britannia, then, has resolved itself into considerations of economic milling. The first step in the treatment is to provide for dry crushing. The ore contains from 5 to 15% moisture, chiefly contained in the fines which amount to about 20% of the total



weight. The fines are removed by using spraying and hummer screens, the oversize being dried with compressed air and then passed to rolls, tube mills and the Minerals Separation plant. The undersize from the screens is reground and dewatered by passing through Dorr classifiers and tube mills in closed circuit.

Originally, water concentration was employed for partial separation of the coarse mineral, in order to lighten the burden on the flotation plant. Then it was found that a satisfactory recovery could be made by flotation alone, and the use of the Hancock jigs was discontinued. The problem then was to increase the ratio of concentration, which by simple flotation was as low as 6 into 1, and differential flotation was investigated.

93% Recovery by Differential Flotation

The use of both copper sulphate and lime for the purpose of dropping the iron and floating the copper minerals was experimented with, and it was found that copper sulphate gave better results than the lime though it was a more expensive reagent. The trouble with the lime was that while the iron was dropped, the floating of the copper minerals was too sluggish in the normal acid circuit to give sufficiently good extraction. This difficulty has been overcome finally by the use of a small quantity of sodium resinate, and the grade of the concentrate has been more than doubled by means of its use. The iron pyrite can be dropped or recovered at will. Two pounds per ton of ore of a mixture of coal tar creosote, pine oil and lime, with minute quantities of sodium resinate, has resulted in the production of a concentrate containing over 93 per cent of the copper in the ore.

The mill is capable of handling up to 3,000 tons of ore per day at a total operating cost of 50c per ton, exclusive of Minerals Separation royalty.

No better example of the character and diversity of the problems relating to ore treatment in British Columbia can be cited than is contained in the descriptions of the operations of these three prominent organizations. Metallurgical progress in British Columbia is well illustrated in these outstanding contributions to the proceedings of the Institute. Especially do they illustrate the profound influence metallurgical development now has, and will have to a still greater extent in the future, upon the growth of the mineral industry.

Problems of far-reaching importance are suggested in each of the operations described, and the success of the metallurgist in demonstrating his ability to build up large-scale operations to meet the varied requirements is one of the most encouraging features in the outlook for mining in British Columbia today.

PIG-IRON FROM COPPER SLAG AT ANYOX

The blast furnace slag at Anyox carries 52% iron, a very good iron ore. Mr. H. S. Munroe, manager of the Granby Company, has announced that the metallurgists at Anyox have succeeded in making pig-iron from this slag in a reverberatory, and that there is hope that the process will be commercially feasible.

SILICATE OF SODA IN SOAP

Silicate of soda, which is abundantly available as a by-product from various industrial chemical processes, is now used extensively in the manufacture of soap. It is a mild alkali and therefore is itself a cleanser. It helps to keep soap hard in the presence of hot water. It is much cheaper than the other ingredients, and its use therefore tends to lower the price of soap.

LETTERS FROM READERS

" Not Guilty "

To the Editor,
Canadian Mining Journal.

Mr. F. H. Mason's letter in your issue of October, 19th, under the above title, endeavors to show that the MacKenzie report was not formally published and therefore the press can be excused for not mentioning the matter.

If you will refer to Mr. Mason's letter, published in your issue of Dec. 22nd last, you will find that he writes as follows: "Mr. Campbell avers that our coal reserve has been over-estimated (probably it has,—Mr. J. D. MacKenzie, who has just revised the figures for Vancouver Island, shows that it has, at any rate)." In other words Mr. MacKenzie's conclusions were public property a year ago. If the papers wished to refer to the matter the same source of information was available to them as Mr. Mason used. As a matter of fact one paper did refer to the matter at that time. The papers as a rule, however, were more concerned about a reported find of coal material in Stanley Park than the shortage of billions of tons in the estimated reserves in the area a few miles away.

Now, in regard to the actual report: I received this last June. It was marked "Issued by the Geological Survey, Department of Mines, Ottawa, June 1, 1923." When a report is "issued" it is "published," for the words are synonymous. I do not therefore understand why Mr. Malcolm states that the report has not been published. He probably means that the edition was limited. I do not know why this edition should be limited, for it is obvious that the importance of the report justified a large edition being issued without delay. Whether the newspapers received copies or not I do not know, but I do know that they knew of it, for I advised them myself. I wrote to three of the leading dailies in Vancouver and Victoria, advising them of this report and of its importance. I referred them to the Survey office in Vancouver for further information should they wish to deal with it. Only one of the papers referred to the matter.

Mr Mason's explanation is not, therefore, the correct one.

There is a certain class of company or community whose aim it is to obtain a meal-ticket without working for it. They want the Government to guarantee their bonds or erect expensive works in their town. The basic argument of these people is "limitless resources." There is another class that honestly believes that we have "limitless resources" and will listen to nothing to the contrary. Between these two and the resulting government obligations, the total is now very close to "All up with Squeers."

Within the last 24 hours newspapers have published announcements that work on logging off "the greatest of Vancouver Island's scenic attractions" will start within two months. If there is one disgraceful piece of work which the present generation of Canadians will have to answer it is the wanton destruction of our beauty spots. Before coming to the Island I had heard people rave over the timber near Cameron Lake. To those who had seen it, it was the one thing they remembered above everything else. It is visited by many thousands annually, and tourists not familiar with our trees stop you and tell you what a wonderfully beautifully sight it is.

I consider our present reproachful position is directly traceable to the propagation of the doctrine of "inconceivable wealth," by most of our citizens and newspapers and I propose to do what I an to counteract the baneful influence of that propaganda.

Cassidy, B. C. C. M. Campbell

NEWS AND COMMENTS

By ALEXANDER GRAY

Better Roads to Quebec Gold Fields

As foreshadowed recently, the Quebec Government will provide better transportation facilities for the Quebec gold fields. Provision is being made for a winter road from the end of the Canadian Pacific steel at the Quinze dam, to Lake Opasatica and Boischatel township. From this north and south commercial avenue, lacking which operations have been hindered, another road will be constructed east to Rouyn. The Legislative Council having authorized appropriations for these purposes, the matter may be said to be settled. It is not stated whether other roads will be made from the transcontinental south to the eastern end of the fields. This action will be welcomed as an indication on the part of the Government of its desire to co-operate in a reasonable way with those who are pioneering under difficulties. Most of the winter traffic, it would seem, will be via the Kippawa- Timiskaming line, thence by teams to the mining fields. The Quinze power development, moreover is going to establish more than a mining industry. Already a large grounwood mill is mooted. But power for mines brings a higher price than it will for commercial purposes. That is why the Quinze power people hope to see rapid mining developments — and it looks as if there would be such a development.

Ducal Development of Sisco

A revision of terms is said to have enabled the Duke of Manchester to obtain possession of the Sisco property on Lake De Montigny, which Mr. Spearman has commended because of recent disclosures at outcrop. A certain sum per month is to be expended for a year, and Mr. Sisco is to get so much per month. At the end of a year a cash payment is provided for. Mr. Spearman, who has visited the property and is impressed with its latest aspects, was largely instrumental in effecting the compromise deal, and it is understood he will direct the work.

Sunburst Outburst

Under display headlines, without reservations, the press of New York City and Canada lend their aid to advertising of P. Chester Thompson, "noted geologist," "President of the Royal Canadian Syndicate," erstwhile "foreign scout employed by big American interests", sponsor for the oil development in Columbia, Madagascar and Venezuela, now satisfied that he is leading actor in the exploitation of "the greatest oil field in the world, without exception," in Southern Alberta. The next six months promise to be "most sensational" in the Kevin-Sunburst area, potentially the biggest ever. Right on top of the Sweet Grass Arch, sustained by the results obtained from 100 new wells last year in Montana, P. Chester Thompson is hailed by someone resident in Newspaper Row as Canada's deliverer, just when producers in distress were hoping over-production of oil was nearing its peak or past the peak. Within six months, Mr. Thompson maintains, the Imperial, Standard of California, Producers Refiners (now the Standard), Talpey Arnold, and others engaged on twelve wells, will confirm the newspaper decree that Mr. Thompson is a "noted geologist," as "noted," maybe, as Lord Kelvin, his namesake, was in another place and sphere.

Thus far, in Western Canada gassers predominate. Without detracting from the versatility of Mr. Thompson and wishing him more success than is in sight on this side of the international border, it might be as well to call other expert witnesses and wait their authoritative pronouncements. Undoubtedly progress is being made with local structures; but the knowledge gained is inconclusive.

Mason Valley Absorbs Bluestone

Canadians are at attention because of the deal whereby the W. B. Thompson Mason Valley people acquire the Bluestone property and plant, which Mr. Charles D. Kaeding managed for the late Capt. De Lamar, and where Mr. Dowsett, of the Dome Mines, had charge of the mill during the time the Dome was closed down. Hardly had Mr. Samuel W. Cohen, on behalf of Sir Mortimer Davis and Mr. David Steindler, closed the deal for the Bluestone, in Nevada, when the Armistice left copper metal markets in the doldrums. Canadian money had been subscribed as part payment; considerable copper was in hand; installments had to be forthcoming so soon and no later. The commitment was about a million and a quarter dollars. Messrs. Kaeding and Dowsett did all they are capable of, but the Fates were adverse. There is no need of repeating the details. Messrs. Steindler and Davis could not contend against prevailing conditions. The recent death of Mr. Steindler made necessary, or made possible, the negotiations conducted through Messrs. Poillon & Poirier, Mining Engineers of New York, so well and favorably known throughout the North Country, where they have served in varied capacities, administrative, consultative and operative. Mason Valley capital is doubled to a million shares of $5. The Bluestone Mining & Milling Company gets 246,268 shares for its property and plant. The combination is mutually beneficial. Messrs. Poillon & Poirier have been congratulated upon having arranged the nuptials

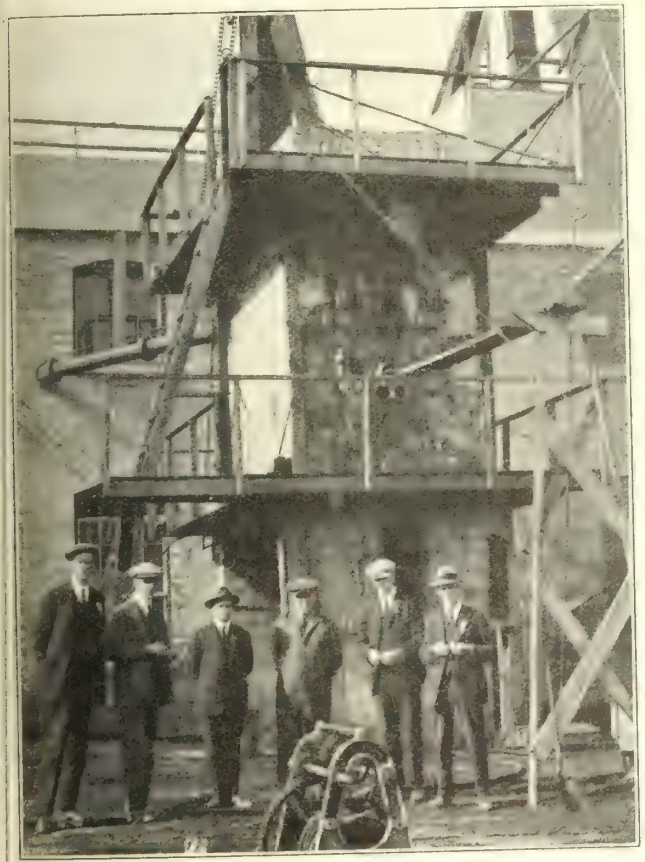
Nipissing in Rouyn

So long as part of Nipissing's surplus of $4,730,404 in cash, government bonds, bullion and ore is to be employed upon other gold or silver properties, it is immaterial whether the company has taken over the Powell area in Rouyn township, Quebec, or something else that the executives deem worthy of a try. The first rumors were that the Noranda had been acquired. Now it is said it is the three Powell claims, which the Noranda dropped, and where considerable work was done, with interesting, if insufficient, results, in view of the purchase price. If Messrs. Watson and Knight have a mind to make an effort in Quebec, it can be accepted that Quebec deserves it. Nipissing has tried to find "another Nipissing"—but they are hard to find. It requires something out of the ordinary to measure up to Nipissing standards. With Nipissing's hall-mark on something new, and good enough for Nipissing chiefs, the Northland would be given a boost that would mean much to it

LIGNITE CARBONIZING FURNACE IS SUCCESSFUL

The central item of the Annual Western Meeting of e Canadian Institute of Mining and Metallurgy held Estevan, Saskatchewan, last month was the inspec- n of the lignite beds in the vicinity of Souris and lenfait and across the border in North Dakota. ese beds of lignite constitute one of the principal serves of fuel on the continent, though their present efulness is restricted by the high content of mois- re and the tendency to break up on shipment and exposure to the air, as well as the liability of the ned product to spontanous combustion when stored long periods.

The Lignite Utilization Board of the Dominion and skatchewan governments (Manitoba has dropped t) have recently operated successfully at Bienfait e modified Hood-Odell carbonizing oven shown in e accompanying photograph. This is a simple brick



odified Hood-Odell Carbonizer at Bienfait, Sask. In the reground are the Secretary and members of the Institute. the background is the building housing the former plant of the Lignite Utilization Board.

ack into which raw lignite is fed continuously at the p, lignite char being discharged at the bottom. ombustible gas from the top of the stack and air e introduced, also not far below the top and the aseous products of combustion are collected and may treated if desired for the recovery of by-products. he partial combustion of the lignite thus simply effec- d removes the volatile matter sufficiently to give a iable charcoal-like residue, which makes a first-rate uel when compacted by briquetting. Instead of ex- ending the money necessary to install an experimental riquetting plant the Lignite Utilization Board have ecided to send some of the char to Hebron, North Da- ota where the United States Bureau of Mines has a suitable plant already installed and available for the Canadian experiment.

The Hood-Odell carbonizer, as installed at Bienfait, is a simple brick stack of square cross-section with a hopper-like bottom. Screened lignite of nut size is fed at the top, and in its descent is stirred up by means of air-cooled pipes placed across the interior of the stack. Drying and carbonizing are effected by the simple expedient of passing ignited gas across through the top of the stack, a maximum temperature of 1200 degrees F. being attained. As the ignited material continues downward through the stack its temperature is reduced below the point of ignition, and the char is discharged periodically through a gate at the bottom. The char is light and friable, much like charcoal, and contains 10 to 15% volatile against 38 to 40% in the raw lignite. This small experimental unit gives 10 to 12 tons of char per 24 hours.

As could be expected from the nature of this operation, the yield of by-products is small compared with a distillation process. At present about 35 pounds of tar per ton of lignite is recovered, which contains 65% pitch and 35% oils the latter being 35% creosote. The pitch thus recovered is one-fifth of that required as a binder in briquetting the char, and will have to be supplemented by pitch from other sources. Experiments are now under way with a view to separating the pitch from the tar.

The gas drawn off from the stack has a low calorific value, but the quantity available beyond that required for burning again in the stack is equivalent to three tons of lignite per day and it can be used economically to raise steam or for similar purposes. Its analysis is approximately:

carbon dioxide	12%
carbon monoxide	12%
hydrogen	11%
methane	3%
nitrogen	62%
	100%

It is estimated that the briquettes can be turned out at a total cost of $9.50 per ton. If that should prove to be the case, this excellent manufactured fuel will compete in Winnipeg, the nearest large market, on favourable terms with high-grade domestic coal from Alberta, which now virtually holds that market. Drumheller coal at present costs $4.50 f.o.b. cars, and the freight rate to Winnipeg is $4.80. Saunders Creek coal costs $6.00 on the cars, and the freight is about the same. Saskatchewan lignite costs from $ 2.10 to $2.50 for run-of-mine, and $3.50 for selected lumps, on the cars and the freight rate is $2.40, and a good deal of it is being shipped to Winnipeg during the fall and winter months.

It appears that now, at last, a simple and effective method has been found to turn the lignite into a first-rate fuel. When this shall have been demonstrated fully, Saskatchewan's fuel resources will become at once immensely more valuable.

The output of coal in the United States for the first ten months of 1923 is 456,728,000 tons, which exceeds all previous outputs except that for 1918, which was 489,239,000 tons for the corresponding period.

Engineers and the Proposed B. C. Steel Plant

Western Members of the Institute Endorse Unanimously the Report of their Executive

A representative expression of the opinion of the West's technical men on the proposals of the promoters of Coast Range Steel Ltd., was given at the business meeting of the British Columbia Division of the Canadian Institute of Mining and Metallurgy, held at Rossland during the annual meeting last month. The Executive Committee of the Division took advantage of the occasion to obtain endorsation of their action in voicing a warning in regard to these proposals.

The subject was introduced by the Chairman, Mr. Thomas Graham, who called upon the Secretary to give an account of the steps that had been taken by the Executive, Mr. H. Mortimer-Lamb recounted the meeting of a special Committee with Mr. Landahl, when he promised to give every assistance to the Executive of the division in investigating his scheme. Mr. Lamb went on to state that he had attended a meeting of the Victoria Chamber of Commerce upon the instructions of the Executive, and described Mr. Landahl's subsequent rescission of his offer to assist the investigation of the Executive Committee. Mr. Lamb stated that the Committee had been taking active steps to secure authoritative views upon all the salient points of the project, and he then read out to the meeting a letter he had addressed to the Premier of British Columbia on behalf of the Executive. The letter was as follows:—

Letter to Premier Oliver

12th October 1923.

"The Hon. John Oliver,
Premier of British Columbia,
Victoria, B.C.

"Dear Sir:

"By virtue of its charter granted by Act of Parliament, the Canadian Institute of Mining and Metallurgy as a national organization representative of the mining profession and industry of Canada, has always sought to avail itself of opportunities to act in an advisory capacity to the Governments of Canada to which it owes responsibility in the service of the mining industry of the country.

"The British Columbia Division of the Institute has for some time past interested itself in the question of the establishment of an iron and steel industry in this province, and ardently desires to assist in any movement towards that end having a justifiable basis. In evidence of this desire the action of the Division may be cited in recommending last year to the Honorable the Minister of Mines, the advantage of securing the co-operation of the Dominion Geological Survey to determine more definitely the iron ore resources of the Province. We believe that the results of this investigation will, in due time, indicate the existence of resources that will form a valuable asset, and that the position of British Columbia as a producing and manufacturing Province may reach proportions that can hardly be gauged by the present situation. We look forward to the possibility of an iron and steel industry in British Columbia founded on proven facts and justified by industrial conditions yet to materialize.

"For these reasons the Executive of the Divis views the problem of an iron and steel industry one of such moment to the welfare of the Province a as being fraught with such ultimate possibilities a fecting its standing in the eyes of the world as to c for the greatest possible care in the matter of presentation, but regards with grave distrust t proposals of Coast Range Steel Limited in which appears that the endorsement of the State is c sidered to be necessary to the acceptance of c jectures upon yet unproven statements and calcul tions.

"The Executive has devoted considerable time to t consideration of information regarding the salie features affecting pig iron production and witho further reference to the question of the supply of ir ore than is implied in the evident desirability to awa the report of the Geologist employed by the Domin Government at the instigation of the Hon. the M ister of Mines to investigate the resources, it h concluded that the main criticism of the proposals Coast Range Steel Limited, may be summarized general terms as follows:—

"There are no reasons for supposing that pig ir could be produced in British Columbia any cheape than it is now being produced at established centre and therefore, the opportunity for competition in th open market is problematical, while the local mark must rely upon possible future developments to absor the product of a plant such as is proposed.

"The whole scheme therefore depends for its just fication upon future developments and not upon ex tent facts.

"The Executive feels called upon to voice its co sidered opinion that it is not in the interest of th country's credit any more than it is to the interes of the tax-payer to embark upon an undertaking th in its essentials amounts to a gigantic proposal f discounting future possibilities.

"On the score of finance the following consideratio are added:

1.—Any proposition requiring guarantees coveri the entire capital must be inherently unsound.

2.—If a proposition is economically attracti capital is usually available for it without Gover ment guarantees.

3.—Under such conditions capital requires reaso able proof of the attraction, and a Government cann give financial assistance upon less assurance of s curity than would be required by the private invest

"The character of the liability proposed by Coas Range Steel Ltd., is not such as to warrant its being incurred by the Provincial Government at this time and especially in view of the fact that iron and steel industries in Eastern Canada, where natural cond tions are at least as favorable as in British Columb and market conditions eminently more so, have ofte failed to show a profit despite Government assistance.

"The Executive desires respectfully to submit these views for your consideration with a request for your sanction to publish this correspondence in the publ press.

"The Executive, on behalf of the Institute, will be

most happy to place its service at the disposal of the Government in any further investigations of this matter.

"The members of the Committee subscribing to this letter are, Mr. Thomas Graham, Chairman; Mr. H. G. Nichols, Mr. F. W. Guernsey; Prof. H. N. Thomson; Mr. Nichol Thompson; Prof. W. L. Uglow; Mr. H. Y. Russel; Mr. S. J. Crocker, and Col. J. E. Leckie.

I am, dear Sir,

Yours faithfully.

(Signed) H. Mortimer-Lamb.

Engineering Judgment the Basis of Conclusion

The Chairman then called upon Mr. H. G. Nichols to explain the attitude of the Executive in this matter. Mr. Nichols said that the attitude of the Executive had been that of an engineer called upon for an opinion upon a proposed investment. In such cases, the engineer has to get his facts first, and his judgment and experience may only be applied in the manner and to an extent justified by such facts.

In regard to iron and steel production, all those present had been aware of certain natural conditions of a sufficiently encouraging nature to demand investigation, to the end that facts might be established upon which some opinion might be formed, and a scheme outlined that would be in keeping with the present outlook. When the promoters of Coast Range Steel Ltd. put forward their proposals, it was thought at first that they must have made such an investigation and secured such facts, but enquiry proved this not to be the case, and it was then that the Executive felt called upon to express its distrust of the scheme, especially as it was based upon State guarantees.

The Executive did not criticise the promoters of Coast Range Steel Ltd. for their optimism in regard to the future of British Columbia; that was not their exclusive prerogative. But the Executive might be excused for some astonishment at the facile methods by which certain well recognized possibilities had been transformed into arguments in favor of a great financial undertaking. They were not the methods of sound technical advisers. Mr. F. W. Guernsey also spoke for the Executive, and said that his own conclusion had been directed by an entire disagreement with the financial considerations connected with the scheme. Several members expressed warm approval of the action of the Executive and a resolution was carried unanimously endorsing it.

EXPLORATION IN GILLIES LIMIT

The success at the Keeley and Frontier silver mines in South Lorrain, Ontario, has stimulated exploration in several adjacent areas with similar geological formations. For instance, a syndicate has acquired an area of over 300 acres covering the Keewatin-diabase contact in the vicinity of Borden and Botha lakes, in the southeastern part of Gillies Limit, and is engaged actively in exploring the ground. Trenching during the past summer has disclosed two veins of calcite containing cobalt bloom, in diabase. It is proposed to follow these veins to the contact with the Keewatin greenstone, several hundred feet underground, in order to find whether or not a concentration of silver values such as that found in South Lorrain and at the Beaver and Temiskaming mines has taken place here also. The project has been endorsed by responsible engineers familiar with the Cobalt district.

PROGRESS AT LORRAIN TROUT LAKE MINES

Another silver producer in South Lorrain is foreshadowed in the progress report submitted last month to directors of the Lorrain Trout Lake Mines, Ltd., (held largely by the Mining Corporation) by the manager, M. F. Fairlie. The report, in part, follows:

Shaft Sinking—This was continued as a prospect shaft following the Woods Vein to a depth of 275 feet. Down to this point no water had been encountered and fortunately pumping apparatus was unnecessary. This is now required, and, while the equipment is being installed, drifting North and South has been started at a depth of 240 feet.

Results in Shaft Sinking—At the present depth of 275 feet the rock formation is still keewatin, though the underlying diabase may be reached within the next 75 feet of sinking.

The Woods Vein as exposed in the shaft continues to maintain its remarkable strength,—it's width varying from 3 feet to 6 feet between walls. It is much brecciated and altered and oxidation is still in evidence at the shaft bottom. The footwall section of the vein, with a width of 10 inches to 24 inches, is largely crushed and decomposed smaltite carrying varying values in silver. In same places very high-grade silver has been exposed, but these showings have been avoided in channel sampling.

Results of Sampling in Shaft—[Forty-six samples at five-foot intervals show the vein from 4 inches in width, assaying 321½ ounces, to 54 inches wide, assaying 64.8 ounces, the average width sampled being 22½ inches. The assay samples run as high as 2214 ounces across 19 inches, though very high-grade ore was excluded from samples.

Results in Drifting—The only lateral work so far done is at the 240 foot level, where drifts North and South from the shaft have been started. The North drift at this date is advanced 44 feet and the South drift 36 feet. The total of 80 feet of drifting shows the same average width and apparent assay values as the shaft. Sampling results will be available in about one week's time.

Surface Trenching—Several transverse veins have been exposed by surface trenching and are shown on the accompanying Surface Plan. Exploration of these veins will eventually be carried out under ground.

Future Operations—Shaft sinking will be continued in the course of a few days and carried at least to the diabase contact. It is of interest to note that the present shaft bottom at 275 feet is more than 200 feet above the 7th level of the adjoining Keeley property.

Conclusion—The values disclosed in shaft sinking and drifting are remarkably consistent for the South Lorrain District and, in view of the altered and oxidized condition of the vein, there is great promise for the future development of high grade ore at greater depth.

The area so far opened up will permit profitable extraction of mill grade ore for the full vertical distance from the surface.

HIGH LABOUR COSTS PREVENT EXPORT TRADE

A recent American visitor to Australia has stated his opinion that the Commonwealth will never be able to work up much of an export market in metals, due chiefly to high labour costs. High wages and the prevalence of the 35-hour week are chiefly responsible for this.

ALL-SLIMING AND BLANKET CONCENTRATION

In his report on 1922 operations on the Rand, the Government Mining Engineer, Sir Robert Kotze, makes the following remarks about recent metallurgical practice:

The innovations at the Springs Mines reduction plant have now been in operation for some months, and, so far, the results have fulfilled the anticipations of the engineers, who, after searching experiments and investigations, had the courage to spend the money in putting their ideas into actual practice.

In the new portion of the plant the old-fashioned gravity stamps, which have survived from the earliest days of these fields, have been entirely discarded, being replaced by ordinary stone crushers with slight adjustments. The crushed product is fed directly into tube mills, and eventually all reduced to slime, which is cyanided in the usual way, sands treatment being entirely eliminated. The tube mill product is classed in a Dorr classifier, the first of its kind on these fields, which is a marvel of simplicity and efficiency for this special purpose.

As a result of a few months' working, the designers of this plant make the following claims, viz.:—

1. Reduced capital expenditure is estimated at 30 to 35 per cent.
2. Reduced working costs, due to elimination of the staffs usually employed on amalgamation and sands treatment. A considerable saving is also effected in pumping the pulp, which, as slime, naturally has less wearing effect on the pump blades. The treatment of slime is also admittedly cheaper than in the case of sands.
3. Increased extraction of gold, due to the greater fineness of the treated slime as compared with equal units of the old plant. the figures in this connection are 78 per cent, under 200 mesh, as against 58 per cent. in the old plant. The extra fineness gives a higher extraction with correspondingly lower residues.
4. Decreased loss of gold through theft, owing to entire absence of amalgam and the comparatively simple manner in which all the vital processes of reduction can be assembled under one roof, with closer supervision.

The practice of abolishing the usual amalgamation procedure on battery and tube mill plates is rapidly spreading. A coarse corduroy cloth is now spread on the tube mill tables, which efects a concentration of the heavier particles in the pulp, which are washed out in launders every two hours. These concentrates are subsequently further concentrated on Wilfley tables, and the final product caught in amalgamating barrels or other similar contrivances. At one large mine in the district where this practice has been recently adopted the residues have been brought down by 0.04 dwt. per ton, a very considerable saving over a large tonnage. It is further claimed for this practice that the chances of theft of gold are considerably minimised. Special arrangements are also made on this mine for recovering platinum iridium, the recovery being close on 20 ounces per month.

It is reported that gold on a payable scale has been discovered at Yanawai, Vanualovu, in Fiji, giving a yield of 54 ounces from 35 tons. The Government have asked New Zealand for the loan of a mining geologist to advise on the question of working the area.

USES OF RUBBER IN THE MINING INDUSTRY

by Q. E. F. in The India Rubber World

Much has been written in recent years regarding rubber surpluses and the need for new uses of rubber. In the latter direction much has been proposed and considerable accomplished, yet only the more obvious possibilities of rubber seem to have been seriously considered. It is also a curious fact that the most original proposals for the use of rubber come from persons outside the trade. While many such suggestions are admittedly impractical, the mere fact that a suggestion is revolutionary should not condemn it until it has had a fair trial and failed. Such a trial has time and again resulted in the birth of a new line of rubber goods. As time goes on we shall undoubtedly see the development of innumerable new uses of rubber, many of which will not singly consume a great quantity of rubber, but in the aggregate will greatly swell the total consumption.

Basic Industries Should Be Studied

It is an unfortunate tendency of many manufacturers of rubber goods, as in numerous other fields, to follow along their accustomed rut, apparently wearing smoked sheet glasses, confining themselves to their regular line of products, and lacking the vision to extend and reapply them to new fields of industry and popular usage. Somehow the man in another industry too often senses the practical application of rubber to it before the rubber man does. Possibly this may result from the present tendency toward quantity production of a limited line of products. It may be good business but it does not make for progress. Certainly it presents an opportunity for new concerns to gain a foothold in the rubber industry.

To find practical new uses for rubber requires systematic investigation, a lively imagination, an open mind, and a willingness to experiment. Thus far most of the newly suggested uses of rubber have been evolved in haphazard fashion, but the time seems near at hand when the research departments of progressive rubber concerns will comb thoroughly one by one all the great industries, process by process and machine by machine, in search of ways in which rubber may serve better than the materials now in use. And in this campaign the voluntary suggestions of experts in the various industries may prove quite as productive of revolutionary applications of rubber as the investigations of rubber men.

Ball Mill Linings

For example, take mining, a basic industry supplying the raw materials for numerous lines of business of world importance. Just as rubber lined ball mills[1] are already demonstrating their numerous advantages and general superiority over steel lined mills,[1] so the mining industry offers numerous opportunities for the successful application of specially designed rubber goods, either to supplement the devices already in use or to supplant them altogether. The following suggestions are made with emphasis on the fact that a mine manager or mill superintendent is continually striving to save a fraction of a cent per ton of ore mined and milled and to do so is ever ready to adopt a new product or adapt an old product to a new use.

Possible Uses in Handling Ore

Following ore from its source deep in the mine through the mill discloses several ways in which rub

[1] Canadian Mining Journal Aug 10th 1923

ber might be applied advantageously. Ore blasted out in the mine is conveyed to the crushers in cars of steel or iron. The life of a car is short owing to the heavy wear of rock on steel in filling and dumping. Rust, due to water in the ore, hastens the disintegration. Cars with rubber lining to take the blow of the ore would reduce the cost of mining by making them last longer. Moreover, the water in the ore will wet the rubber, rendering it almost frictionless and prolonging its life for the present purpose.

The car of ore is rolled along to the dump at the crusher. Some cars are tilted and banged against a steel or wooden bumper, which damages the car and wears out the bumper. A rubber bumper would save the car and reduce costs.

After the ore is dumped it frequently slides down a metal chute, which wears rapidly, especially where there is much water in the ore. But this water would make the ore slip down a sheet of rubber with little wear, saving time and money.

If the ore goes into a bin it usually comes out on a feeder. Some of these feeders are rubber covered belts, but others are just chutes. A metal covered belt would not last long enough to mention, but a rubber covered belt does. Where the ore slides out of the bin why not line the chute with rubber?

The crushed ore is fed onto a concentrating table covered with linoleum, probably because linoleum manufacturers have been better salesmen than rubber manufacturers. If a concentrating table was ever properly covered with rubber and the rubber discarded in favor of linoleum it was the rubber manufacturer and not the rubber that failed. These table tops are covered with little strips of wood nailed on with copper tacks. When the linoleum is to be replaced all these wooden strips and tacks must be removed, and it is a lengthy job. Linoleum manufacturers are making ribbed strip coverings for automobile running boards. It ought to be possible for some rubber manufacturer to make a molded rubber top for concentrating tables that will eliminate the wooden strips. These strips are placed in various positions by table manufacturers, but there may be enough of any one kind to make molded rubber coverings profitable.

If rubber lined pumps, rubber lined ball mills and rubber covered belts outwear steel, why not use rubber in other work where abrasion is an item to be considered in costs. For example, rubber lined pumps are commonly forcing abrasive materials into metal pipes which must be replaced frequently, especially at the elbows. How about rubber lined elbows and pipe? They might cost too much, but that ought to be figured out by actual test.

The Basis for Wider Applications

Carrying this principle into a wider field of usage brings a thought regarding ash handling. Ashes propelled by steam are lifted out of buildings and boats through metal pipes, but the ashes cut away the bends. A rubber lined bend wet with a small jet of water to lubricate it would probably outwear any metal in existence.

In general it may be confidently said that any place in a mining or milling operation where ore strikes against or slides on metal, especially when wet, or where iron, steel or wood is used to protect something from abrasion, is a prospective place for the use of rubber, bearing in mind that rubber at 60 cents per pound is equal or better than steel at 13 to 14 cents per pound. It can be molded to fit any conceivable place, and when the proper compound is used it will outlast any other material.

ANNUAL REPORT OF ANGLO-CANADIAN EXPLORERS

English Company Represented in Canada by A. D. Miles acquires three properties during its first eight months of operation

In presenting to shareholders the annual report of Anglo-Canadian Explorers at the first annual meeting in London on October 16th, the chairman, Hon. Lionel Holland, said:

The nominal capital of the company is now £125,000, in £1 shares, and of these some 100,000 odd have been issued—all subscribed for cash—with 7s. 6d. a share remaining to be called up as funds are needed. Formed some fifteen months ago as a private company, with a capital of £65,000, it soon became apparent that the company had entered a field of large possibilities, which every month were attracting more and more the attention of the mining world. We had been successful in establishing an efficient exploratory and mining organisation in Ontario; we had secured, in Mr. Miles, a representative of first-rate mining experience and reputation, efficient and reliable, intimately acquainted with the district, and he is assisted by a small but thoroughly competent geological and engineering staff. Thus our organization and management have won the confidence of mining people in Ontario, so that prospectors and owners of mining concessions have realized that this company is not out to snatch a hasty profit, or to do a deal in shares, but rather to test thoroughly properties that it takes in hand, with the one aim of discovering mines of real commercial value.

250 Gold Properties Examined

In this way the company was put into a position to pick and choose among a wide range of properties—obtained a choice of options upon terms that may be regarded as reasonable, and for periods that admit of the work needed to test the areas under option. You will appreciate the magnitude of this mere business of selection when you note the information in the report—how over 250 gold mining propositions in Canada had been submitted to Mr. Miles by the end of last March, although I need scarcely add that only a small proportion of these have been transmitted for the consideration of the board and managers in London.

Although, then, we have enjoyed—and, as yet, still enjoy—so favourable an opportunity for taking up likely options, competition in the mining fields of Ontario is becoming more keen, and capital—especially capital from the United States—is being attracted to these areas, which were visited a few months ago by some 200 members of the American Institute of Mining Engineers. We thought it very desirable, therefore, with the assent of our shareholders, to increase the capital of the company by another 60,000 shares, so that we might be in a position to take options at once over more properties than our original capital admitted, and to have the funds needed to test their value. Our issued capital is now, as I have mentioned, over £100,000—all subscribed for cash. There are no vendor's shares, and we hold a balance of over 24,000 shares unissued.

Seven Properties Under Option

This capital will suffice for our present aims and requirements, to take under option a limited number of selected areas, and to complete all the exploratory work necessary to test these areas and prove their prospective value as mines—in short, to proceed with our work on a scale

that, I hope, may result in valuable discoveries. On the other hand, the available capital by no means exceeds the requirements of our programme. We have still to be careful not to spread our activities too widely, but to concentrate our serious development work and expenditure on such few selected properties as appear to show the best promise.

Of the forty mines, or mining areas, that our engineers have up to now examined, we finally took options over seven, in order to proceed to prove their value further by diamond drilling and other preliminary development work. Three—I think I may now say four—of these we are not proceeding with further. The results of our testing work were not sufficiently encouraging. But this, of course, is far from meaning that these properties, over which we have resigned our options, have no value, that they may not ultimately be developed by expenditure upon deeper operations into mines of commercial value. It means only that we are not possessed of the purse of Fortunatus, and must apply our resources in the first instance to properties where surface indications and discoveries at the higher levels are the most promising. Had we indeed an inexhaustible purse, chances of success as inexhaustible appear to be offering in the enormous area of the pre-Cambrian rocks of Canada.

Three Option Taken Up

The report informs you that we have now in hand three properties—the Queen Lebel, the Gull Lake, and the Kirkland Townsite—all on the Kirkland Lake field. In the Gull Lake mine we have a third interest in a company registered in London, with a capital of £60,000. Over the Queen Lebel and Kirkland Townsite properties our company holds options for periods which will allow of a thorough examination. The work on all these properties is well in hand. Already good progress—exceptionally rapid—has been made with sinking a shaft and some crosscutting on the Queen Lebel area, where a surface break or lode exposed is considered one of the best in the district. Two diamond drill holes have been going down on the Kirkland Townsite area to locate the site for a shaft, and a plant for sinking the shaft will be delivered on the property this month or early next month. The London Gull Lake Co. is already clearing the ground and trenching, preparatory to commencing underground work.

We shall take up two or three additional options. Our engineers are now engaged upon examining three or four other properties, where the surface indications and other appearances are encouraging. We have, besides, ventured a bit further afield from the Kirkland Lake and Porcupine districts, and have staked some claims on our own account in an undeveloped territory further to the west in Ontario, where surface features and showings of gold are promising, although we do not contemplate undertaking work of any consequence on these claims at present.

Progress at Kirkland

Generally, I may say that our technical advisers—our representative in Canada and our managers, Messrs. John Taylor & Sons, here—view our prospects most hopefully, and a visit just recently paid to Ontario by Mr. Kenneth Taylor and our admirable secretary, Mr. Bayley, serves to confirm this view. They have returned more than satisfied with the efficiency of the organization that Mr. Miles has established on the field, and with the likelihood of successful results. Of course, our venture is a mining speculation, but a speculation of unusual promise, with unusual possibilities of profit. Our options are situated in proved goldfields—fields of increasing importance. The production of the Kirkland Lake area for the first six months of this year is almost equal in value to the total production for the twelve months of 1921—a value, roughly, of some £300,000 for the six months, compared to £325,000 for the twelve months of 1921; or, to compare results with last year, in the twelve months of 1922 gold to the value of £460,000 was produced—in the first six months of this year to the value, as I have said, of £300,000. Then in the Porcupine field, as you will know, the Hollinger mine ranks now as the third largest gold producer in the world. Taking the whole of Ontario, the gold production for the twelve months of 1922 was of the value of £2,143,500 odd, whereas for the first six months of 1923 it valued over £1,883,200.

We hold our options in the neighbourhood of producing mines, yet on a field only recently taken in hand at all seriously with adequate skill and capital. Although the winter there is severe, yet underground mining is continued right through the year, and it is a field that lends itself to economial development. Our areas are being selected with caution—picked areas; we shall test them thoroughly, and make no attempt to exploit them until satisfied upon their prospective value as mines.

PERSONAL AND GENERAL

Mr. W. C. Wallin, superintendent of the coke ovens at Sydney, is on a visit to the Pittsburg district where he will make a special inspection of coke oven plants. Mr. Wallin visited England a short time ago for the purpose of learning the latest in coke production in that country.

Mr. John A. Swanson has been appointed superintendent of the Hidden Creek mine at Anyox, B. C. in succession to Mr. J. Tuttle. Mr. Swanson has been with the Granby Company since 1898, when operations at Phoenix were just commencing. His assistant will be Mr. W. Coulter, who has been with the Company since 1914.

Mr. Frank Carnegie is in charge of operations at the old Foley mine near Mine Centre in northwestern Ontario. The mine workings are being unwatered and sampling is proceeding as the waters recede.

Dr. A. R. Ledoux died at his home in Cornwall-on-Hudson on October 25th. Dr. Ledoux has been, for many years, an international figure, known to a large number of Canadian miners and metallurgists, both personally and professionally. He was seventy years old.

Mr. P. E. Fisher, President of Pacific Coast Pipe Co. Ltd., Vancouver, B. C. died at Seattle Wash. on October 21st. He was born in New York 57 years ago and went West in 1903. In 1904 he organized the Pacific Coast Pipe Co. in Vancouver, B. C. and similar companies in Spokane and Seattle, Wash., and later in Portland, Ore. He disposed of his Seattle and Spokane factories about ten years ago and sold his Portland plant to American interests, centering his activities on the Company at Vancouver.

WORLD PRODUCTION OF COAL

During the first six months of 1923 the world production of coal was 660,000,000 tons, an increase of 79,400,000 tons or 13.3 per cent. over the first half of 1922, according to data published by the United States Geological Survey. Canada's quota is 4.12 per cent. of the total.

METAL MARKETS

Average for week ending Nov. 3rd.

Prices in cents per lb. as quoted by Consolidated M. & S. Co.)

Electrolytic Copper, per lb.	14.50
Zinc, per lb.	8.00
Lead, per lb.	7.57

THE MINING DISTRICTS

NORTHWESTERN QUEBEC

Progress on Noranda. — Reports from the Rouyn District of Northwestern Quebec indicate that the Noranda find is of very substantial promise. Recent work has proven a surface area 100 feet wide for a length of 300 feet, with a further indicated length of approximately 400 feet. The average value for this area is understood to be over $5.00, while sections on each side run much higher. A shaft has been started and is down approximately 25 feet. A small mining plant is being installed and the shaft will be continued to about 150 feet, at which point lateral development will be undertaken. During the winter it is proposed to diamond-drill the property. On the Horne group, which is also under option to the Noranda Company, the first diamond-drill hole gave about 7 per cent. copper and about $6.00 in gold across a width of 100 feet. Later holes did not substantiate these results, and now it is proposed to drill a number of vertical holes.

Improved Transportation Service. — Transportation into Rouyn during the coming winter will be improved. A road is to be built from the end of the steel at the Quinze dam, which will be approximately 70 miles in length. This road will effect a very substantial saving in the transportation of freight and supplies, and instead of costing about $150 a ton, as was the case last summer, the freight rate should be cut to about $50 a ton. It is also proposed to start preparations for a much improved transportation service next summer. During the past season gasoline boats were used on the rivers and there were a great many delays and breakdowns. Next year it is proposed to use small steamers, which it is believed will provide a more economical and efficient service.

Smaller Claims Recommended. — The Quebec Government is considering the advisability of changing its mining laws, particularly with reference to the size of the claims. Under the present Quebec law, prospectors can stake claims containing 200 acres, and by the use of a number of licenses can stake practically as many claims as they desire. While it is advisable to have a mining area of approximately 200 acres, the great size of the holdings in the Rouyn section has been a disadvantage in the development of the district. Companies taking options were given a much greater acreage than they could properly develop, except at a prohibitive expense, and as a consequence very few companies have taken up the whole of their ground. If the holdings had been in smaller blocks there is little doubt that more prospecting work would have been done and possibly more discoveries made.

REPORT ON WATABEAG AREA

Recently the publication of the map of the Watabeag area in northeastern Ontario was noticed in these pages. There has been published now Mr. D. G. H. Wright's 30-page report on this area, whose geology is in the main similar to that of the adjoining Porcupine and Kirkland areas. It constitutes Part 7 of the 31st report (1922) of the Ontario Department of Mines.

NORTHERN ONTARIO

Cobalt. — A good deal of interest has been aroused in Cobalt by the discovery of an immense float nugget in the Gillies Limit. It is the largest piece of float ever found in the history of silver mining in Northern Ontario, and weighs over a ton and contains approximately 18,000 ounces of silver. The largest nugget found prior to this was on the Silver Gem property, and contained 9,715 ounces. This nugget was purchased by the Ontario Government and is on display in the Parliament Buildings in Toronto. The latest discovery was made on a claim belonging to New Liskeard people, which is located in the same vicinity as the properties in the Limit which the Mining Corporation has under option. Its discovery has greatly stimulated interest in this section. The surface geology of the claim on which it was found consists of Keewatin greenstone overlying the diabase, and the rock adhering to the nugget also consists of Keewatin greenstone. While there is a possibility that the nugget may have come from a vein in the comparatively close vicinity, it is probable that it was derived from veins further to the north and carried down by the glacier.

Prospectors are showing a good deal of activity in Gillies Limit, and several mining companies are also investigating properties there. The Mining Corporation has let a contract to sink its shaft, which is now down approximately 50 feet. The shaft will be continued close to the contact, and in order to determine the depth to which it will be necessary to sink, a diamond-drill hole will be put down. The shaft is being sunk on a vein which in places carries several inches of smaltite, with low silver values.

La Rose is considering the development of the Fisher-Eplett property, which lies to the North of the Beaver. A number of years ago a shaft was sunk to a depth of 300 feet, in one corner of the property, and work was done on one vein. The results were not particularly encouraging, but as it has now been determined that the contact lies at a depth of approximately 500 feet, it is believed that greater possibilities will exist near the contact. A large portion of the property, containing strong surface veins, has not been explored.

Nipissing Exploration. — The Nipissing has been very active this Fall in exploring for new properties. At present the company's engineers are examining properties in the Rouyn district, particular attention being given to that portion of the Noranda group containing the Powell vein, and consisting of four claims. The Powell vein was the original discovery in the district, surface assays giving promising values. Aside from a few test pits, surface work and diamond-drilling only were done by the Noranda company, and since the latest discovery made on the southern part of the property, the company has confined its attention to this latter. The Noranda has a very large acreage, in which there is plenty of room for both the Noranda and the Nipissing to operate. The Nipissing has recently

staked three claims under the waters of Lake Temiskaming, in the South Lorrain area. The claims are located near Silver Centre, and are supposed to contain a continuation of the veins on which the Maidens work is being done. The Maidens is under option to interests associated with the Keeley, and is being developed by them. Accompanying the Nipissing dividend cheques was a financial statement, showing current assets as of September 29th amounting to $4,730,000. Of this amount, ore and bullion in process, on hand and in transit amounted to $543,000, the balance of over $4,000,000 being cash in the bank, bonds and investments.

South Lorrain. — The Mining Corporation continues to meet with favorable results in its development of the Trout Lake property. From the 275-foot level of the shaft, drifting has been carried for about fifty feet each way, with good milling values and some high-grade. Contrary to the general experience in the South Lorrain district, continuous ore was found in the shaft for almost the total depth. A particular point of interest in connection with this property is the fact that the 275-foot level is over 200 feet higher, in a geological sense, than the 7th level of the Keeley mine, which has been such a phenomenal producer. The Mining Corporation has also encountered some new ore on the Peterson Lake property. The veins, while small, are of fairly good grade, and a considerable tonnage of mill ore is being broken.

Porcupine. — Accompanying Dome dividend cheques, dated October 20th, was an announcement that on and after November 14th, shares were to be forwarded to the Empire Trust Company, New York, in order that new certificates might be issued in the ratio of two shares of no par value for one share of the old stock. The financial statement accompanying the dividend cheques shows that for the six months ending September 30th, the gross profits amounted to $1,375,000, from which was deducted tax reserves of $69,000, and plant depreciation and mine exhaustion of $299,000, leaving net profits for the period of $1,006,000. The balance sheets shows current assets of Bonds, $1,153,000; Dividend Assurance Fund, $1,059,000; Loans on Call, $1,250,000; Accounts and Interest Receivable, $45,000; Inventories, $341,000; Bullion in Transit, $80,000; Cash, $195,000. Current Liabilities consist of, Accounts Payable and Tax Reserves, $340,000; and Dividends Payable, $485,000. The reserve for plant depreciation and mine exhaustion stands at $3,504,000. Surplus is shown at $1,138,000.

At the March property, in Deloro, drifting is being done on the 800-foot level. The company reports that the veins carry satisfactory values.

West Shining Tree. — Officials of the Westree property in Shining Tree report exceedingly high assays from diamond-drill holes. The Tonopah Mining Company of Nevada has taken an option on the property, and will continue its development.

NEW HELIUM PLANT

It is proposed to bring up a bill at the next session of Congress to authorize the expenditure by the United States Bureau of Mines of $5,000,000, to purchase helium-bearing natural gas and gas fields. A new helium extraction plant on a semi-commercial scale will be put in operation shortly at Fort Worth by the Bureau of Mines. It is expected that this improved process will produce helium at much less cost than former processes.

BRITISH COLUMBIA

Anyox. — The Granby Consolidated Mining & Smelting Co. are reported to have dropped their options on an iron pyrites property situated on the Extall River and on the Sultana Group on Portland Canal. On both exploratory work had been done, the development on the Extall River deposits having extended over a considerable period. The opening up of the Outsider Group, Maple Bay, is proceeding satisfactorily and ore shipments from this property to the Anyox plant are expected to commence at an early date.

Stewart — Some splendid ore is reported to have been uncovered recently in the workings of the Indian Mines Ltd., Salmon River, Portland Canal. It was struck in the No. 1 tunnel of the mine which now is in a distance of 810 feet. The published description of the find follows: " On striking the ore two drifts were driven on it 18 feet apart, with ore on both walls, leaving a pillar of ore between. In one of these drifts the ore occurs in sulphide form in heavily mineralized quarts, several feet of which being sampled gave returns of 0.68 oz. gold, 210 oz. silver, with no lead. Two feet of solid ore which occurs in the other drift gave a return of 2.72 oz. gold, 7.9 oz. silver and 7.4 per cent lead. Some of the prettiest specimens of native and wire silver ever taken from depth in the camp were brought to Stewart from these workings. " Development is proceeding and diamond-drilling also is under way, the latter, according to statements made by those in charge, being satisfactory in its results.

The Dunwell Mines Ltd., Portland Canal, has been very active in development since the ore-body was crosscut in No. 2 Tunnel. The drift each way is said to be following the foot-wall of the vein, the two faces being now over 700 feet apart. The ore is enriched with secondary minerals. No. 3 Tunnel is being driven at the rate of five feet a day and the ore-body will be struck, it is figured, at a depth of 170 feet below No. 2 Tunnel. The tunnel now is in about 75 feet. The plant consist of a compressor and two machine drills. The Company, it is reported, has withdrawn its stock from the market although some private sales have been made at $1.50 a share. The Dunwell is capitalized at $350,000.

Mining Dividends — The Premier Gold Mining Co., The Howe Sound Mine of the Britannia Mining & Smelting Co., and the Silversmith Mine are the three British Columbia mining enterprises at present on a dividend paying basis. They have distributed $1,800,000 this year. The Premier's dividend for the third quarter of the year brings its total dividends to $4,450,000. The Howe Sound Mine for the first time in several years paid a dividend in the second quarter of the present year, $199,208 being distributed. For the third quarter the same dividend has been declared. The Silversmith has paid $100,000 in dividends this year. For the first quarter it paid $25,000; for the second $50,000; and for the third $25,000. In 1922 it paid $100,000 and in 1921, $25,000, making a total of $225,000.

Electrolytic Iron Experiments — W. B. Timm, chief of the division of ore dressing and metallurgy of the Dominion Mines Department, states that the Dominion Government is constructing a laboratory at Ottawa for investigating the possibility of producing commer

electrolytic iron made from the iron pyrites con-ned in ore waste. Experiments along this line e started several years ago by metallurgists of Consolidated Mining & Smelting Co. at Trail. these tests the experiments were confined to the ores the Sullivan Mine. It is proposed to experiment at awa with the waste of the various operating mines Canada.

Address by Minister of Mines — Problems of Min- on Vancouver Island, was a subject of recent lress to the Kiwanians of Victoria by Hon. Wm. an, Minister of Mines. He referred to placer min- at Leach River, Sooke District, in the early days t to the first developments in metalliferous mining. Sloan was optimistic as to the future of the latter m of industry, mentioning specially in this connec- n the opening up of a large deposits at Jordan er, on the West Coast, the activity on the minerals ims known as the " Old Sport ", Quatsino, and the mising character of prospects such as the Big In- ior, Great Central Lake, and other properties in different mineralized districts of the island. All t was wanted was a healthy copper market to bring se and other prospects into production and some uld become substantial shippers.

Mr. Sloan spoke of the problem of dual control in E. & N. Land Belt, an area comprising about one- arter of the Island. He said that negotiations were progress between the Railway Company and the partment of Mines having in view the administra- n of the base minerals as well as the precious mine- s solely by the Province. These had not yet been ccessful but he was hopeful that a satisfactory solu- n of the problem would be reached.

The greater part of the address was directed to the estion of fuel oil importations to British Columbia d the effect on the coal mining industry. Quoting m recently compiled statistics Mr. Sloan showed that production of fuel oil on the Pacific coast had jump- from eight million barrels a month in late years to enty-five million barrels in July of this year. The ospect was that it would reach the thirty million rrels a month mark during the closing months of e year. All this fuel had to be absorbed by the mar- t. It was being imported to this province in eater quantities than ever before. Coal produced ally was being displaced in the domestic market d the great basic industry of British Columbia was ing threatened. This was a problem, Mr. Sloan as- rted, that it would be well for people to understand. was one that called for sympathetic action on the rt of those in authority as well as by the fuel nsuming public, who desire to see local resour s developed and local industry encouraged.

Mr. Sloan made it clear that, while there were oblems demanding attention, the outlook was bright. stable copper market and an effective check to the rious competition with which the industry is faced ere all that is needed to improve conditions. Given is, nothing could hold back the advance of mining the Island.

RECONSTRUCTION IN JAPAN

It is estimated in Tokio that the rebuilding of the evastated area of Japan will last from five to seven ears and that it will induce a period of prosperity roughout the Japanese Empire, due to the material sed and the employment provided.

NOVA SCOTIA

Miners Ask Increased Wages. — The officers of district No. 26, United Mine Workers of America, notified the British Empire Steel Corporation that in the new agreement shortly to be discussed, they will request the restoration of the 1921 wage rates. The agreement under which they are now working expires on January 15th, but there is a desire to have the matter brought up early and discussed so that an agreement can be entered into without any stoppage of work.

Coal Heaps Almost Gone. — Nearly all coal from the heaps made last winter has been filled away. It is very late in the season to have coal heaps at the collieries, but this was due largely to the strike. There is at present considerable idle time at the collieries, and two of the smaller mines have been closed down, the workmen being distributed among the other collieries.

British Coal in Newfoundland. — A large amount of lumbering has been done in Newfoundland this year and great quantities of pit props were shipped to Great Britain. Coal was brought out as return cargoes and cut into the trade of the B. E. S. Co. Without the advantage of a cheap return rate, the British coal could not have gained much of the market.

Slack Time at Wabana. — The Wabana ore mines may be forced to reduce their output further by laying off 200 men in addition to those already let go. During the whole of this year the Company has struggled to give employment to the largest number of men possible. In addition to ore shipments, 1,000,000 tons are in the stock piles at Wabana, and Sydney is fully stocked for the winter, having 500,000 tons in the bins. Over 700 men will be kept employed during the winter for development and further output. With improved conditions prevailing in Europe, the ore trade may take a sudden change for the better and the Company intends to keep the mines fully developed.

Repairs to Furnaces. — A number of the furnaces at the Sydney steel works are down for repairs. As sufficient stock had accumulated, there is no diminution of the output of manufactured products. Sixty coke-ovens are being heated and will be ready to produce blast-furnace coke by the middle of the month. This, with the 120 ovens now in operation, is strong evidence that the Sydney steel plant is having a fair share of the present prosperity of the steel trade. The new ovens now being heated for the first time were built in 1921.

The Wages Question. — The Dominion collieries have had less broken time in the latter part of October after the coal heaps were filled away. There is much speculation as to the winter's trade, but if the miners are at all reasonable there is little doubt that 1924 will see at least an increase of one million tons over this year. With a wage agreement to be negotiated soon, there is considerable apprehension of labor agitation. This should not be. The wages made by the contract miners are high and rank above those of other classes doing work of a hazardous nature. Any adjustment that might be made (and it is doubtful under present conditions if any can be made) should have for its object the levelling up of the lower paid classes of labor. With steady employment, conditions at the collieries are considered by the miners themselves as very fair.

First Aid Certificates. — The examination of candidates for the different grades of First Aid certificates held some time ago shows that in the Glace Bay district thirty-five of the number up for examination passed. Of these, James McMahon, General Superintendent of Rescue Stations, won the highest certificate, — the Medallion and Label; thirteen won the Medallion; eight the Voucher 2nd Certificate and 13 the First Aid Certificate. The examinations were conducted by Dr. Bruce of Sydney, assisted by G. A. Rowlings, President of the St. John's Ambulance Association.

First Aid Classes. — Night classes in first aid to the injured are conducted each winter by the Dominion Coal Company, and considering the labor agitations of the past two or three years and the exceptional severity of the weather last winter, the progress made has been encouraging. It is understood that an effort is to be made this winter to enlist the support of the United Mine Workers as a body. The locals will be visited and the matter laid before the workmen with a view to enlarging the classes. Supt. Hector McDonald, who is in charge of the work, is an enthusiast and believes that a personal appeal will be all that is necessary to draw the interest of the miners to this important duty.

A peculiarity of Nova Scotia collieries compared with those of Great Britain may be pointed out. Whereas the miners of Britain complain of the lack of interest taken in first aid work by the mine operators, the mine workers of Nova Scotia fail to attend classes in large numbers. Probably this was in the past due largely to the propaganda of the labor leaders against the Coal Company; but when the Company provides the place, the books and all other necessary material for instruction, and the colliery doctors give freely of their time, the response should be generous, as the work is one wholly in the miners' interests and that of their families.

Coal Production.—The Dominion collieries produced 294,596 tons of coal in October, which brings the total for the year to date up to 2,867,000 tons, which is 625,000 tons ahead of last year.

McLachlan Sentenced. — Following his conviction on a charge of seditious libel recently, J. B. McLachlan was sentenced last week to two years' imprisonment, the maximum penalty, by the judge.

New Colliery Site being Tested. — Drillers are at work testing the proposed site of the new colliery at Lingan. A railway spur is under construction and the shaft will be begun as soon as the best location has been determined. The estimated output of the new colliery is 2,000 tons a day, which will rank with the largest.

GRANBY EXPLORATIONS IN 1923

The little weekly of the Anyox Community League, *The Granby News,* publishes in a recent issue the following announcement:

With the snow about to fly, the exploration season of 1923 is practically finished, at least in so far as the Granby Company is concerned; and while there are one or two matters not yet definitely decided upon, the General Manager, Mr. H. S. Munro, announces that the Sultana Group, in the Hazelton District, after considerable prospecting with the diamond drill, has been dropped, likewise the property on the Extal River, belonging to the Dunsmuir Estate. The Sunshine group, in the Portland Canal section, has also been abandoned. A further bond, covering a period of a year, has been arranged in connection with the George property in the same section. Owing to the present condition of the copper market, which shows no sign of improvement for the future, Copper Mountain will be shut down for the present, and those who went from Anyox to that operation will return here until such time as copper conditions are more favorable. At Maple Bay everything is being rapidly put in shape for shipping, as the ore will soon be moving to Anyox from this point. Diamond drilling on the Eagle Claims, adjoining the Outsider group, gives sufficient assurance that a big shipping mine will be developed, and all the ground of any possible worth in this vicinity has been bonded by the Granby Company.

A NEW SWEDISH MOTOR FUEL

Recent experiments carried out in Sweden are said to have demonstrated the commercial value of a motor spirit called "bentyl," which is composed of sulphite spirit distilled from the sulphite lye of the wood pulp mills mixed with 20 to 25 per cent benzol (motor). As there are now 22 sulphite distilleries in Sweden with an annual output of about 20,000,000 liters of 100 per cent alcohol from lye, the new motor fuel may prove to be a serious competitor of imported gasoline. Imports of gasoline into Sweden during 1922 totaled 56,783,000 kilos (approximately 20,000,000 gallons), according to official statistics, of which 28,273,759 kilos came from the United States.—**Commerce Reports.**

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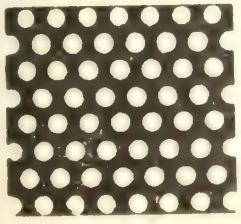

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Canada Foundries & Forgings, Ltd.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
Powley & Moody, Limited.
Peacock Brothers, Ltd.

Cars:
Canadian Mead-Morrison Co.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
John J. Gartshore.
Peacock Brothers, Limited.
Powley & Moody, Limited.
The William Kennedy & Sons, Ltd.

Car Dump:
Canadian Mead-Morrison Co.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Powley & Moody, Limited.
Sullivan Machinery Co.

Cars—Hand:
Sylvester Mfg. Co., Ltd.

Cars—Mine:
William Kennedy & Sons Ltd.

Car Pullers:
Canadian Mead-Morrison Co.

Carries (Gravity):
Jones & Glassco, Reg.

Car Wheels and Axles:
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
John J. Garthshore.
Peacock Brothers, Limited.
Powley & Moody, Limited.
The William Kennedy & Sons, Ltd.

Cast Steel Gears:
Canada Foundries, Ltd.
The William Kennedy & Sons, Ltd.

Castings (Iron and Steel):
Herbert, Alfred, Limited.
Holman, Bros., Ltd.
Peacock Brothers, Limited.
The William Kennedy & Sons, Ltd.

Cement Machinery:
Hadfields, Limited.
Hull Iron & Steel Foundries, Ltd.
The William Kennedy & Sons, Ltd.

Chains:
Dodge Manufacturing Co.
Jones & Glassco, Reg.
Canadian Link-Belt Co., Ltd.
Greening, B. Wire Co., Ltd.
Powley & Moody, Limited.

Chain Drives:
Jones & Glassco (Regd).
Powley & Moody, Limited.

Chain Drives — Silent & Steel Roller:
Link-Belt Limited.
Hans Renold of Can., Ltd.
Jones & Glassco (Regd.).

Chemist:
Thos. Heyes & Sons.
Milton Hersey Co.
Ledoux & Co.

Classifiers:
The Dorr Company.

Clutches:
Link-Belt Limited.
Hans Renold of Can., Ltd.

Coal:
Dominion Coal Co.
Nova Scotia Steel & Coal Co.

Coal Cutters — Coal Pick Machines:
Sullivan Machinery Co.
Canadian Ingersoll-Rand Co., Ltd.
Hebert, Alfred, Limited.
Holman Bros., Ltd.
Peacock Brothers, Limited.

Coal Crushers & Conveyors:
Link-Belt Limited.
Peacock Brothers, Limited.

Coal Mining Machinery:
Canadian Ingersoll-Rand Co., Ltd
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co. Ltd
Hadfields, Limited.
Hendrick Mfg. Co.
Hebert, Alfred, Limited.
Holman Bros. Ltd.
Powley & Moody, Limited.
Sullivan Machinery Co.

Coal Screening Plants:
Link-Belt Limited.
Canadian Mead-Morrison Co.

Cobalt Oxide:
Deloro Smelting & Refining Co., Ltd.

Compressors — Air:
Belliss & Morcom, Ltd.
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Denver Rock Drill Mfg. Co.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Laurie & Lamb.
Smart-Turner Machine Co.
Peacock Brothers, Limited.

Concentrating Tables:
Herbert, Alfred, Limited.
Holman Bros., Ltd.
The Mine & Smelter Supply Co.

Concrete Mixers:
Canadian Fairbanks-Morse Co., Ltd.
Gould, Shapely & Muir Co., Ltd.

Condensers:
Canadian Ingersoll-Rand Co. Ltd.
Belliss & Morcom, Ltd.
Laurie & Lamb.
Peacock Brothers, Ltd.

Condensers — Electrical Static & Power:
Griswold & Co.

Consulters and Engineers:
Milton Hersey Co., Ltd.

Conveyors:
Link-Belt Limited.
Canadian Mead-Morrison Co.
Jones & Glassco (Regd.).

Conveyor Belts:
Canadian Fairbanks-Morse Co., Ltd.
Gutta Percha and Rubber, Ltd.

Conveyor Flights:
Hendrick Manufacturing Co.

Conveyor — Trough — Belt:
Dodge Manufacturing Co.
Link-Belt Limited.
Hendrick Mfg. Co.
Jones & Glassco, Regd.

Copper:—
Consolidated Mining & Smelting Co.

Countershaft Fixtures:
Dodge Manufacturing Co.

Couplings:
Dodge Manufacturing Co.
Hans Renold of Can., Ltd.

Cranes:
Link-Belt Limited.
Canadian Mead-Morrison Co.
Peacock Brothers, Limited.

Crane Ropes:
Allan Whyte & Co.
Canada Wire & Cable Co.
Greening B., Wire Co., Ltd.

Crucibles:
The Mine & Smelter Supply Co.

Crusher Balls:
Canada Foundries & Forgings, Ltd.
Herbert, Alfred, Limited.
Holman, Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
Peacock Brothers, Limited.
The William Kennedy & Sons, Ltd.

Crusher Jaws:
Canadian Steel Foundries, Ltd.
The William Kennedy & Sons, Ltd.

Crushing Rolls:
Canadian Steel Foundries, Ltd.
The William Kennedy & Sons, Ltd.

Crushers — Jaw & Gyratory:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
Lymans, Limited.
The Mine & Smelter Supply Co.
Hadfields, Limited.

Cut Gears:
Hans Renold of Can., Ltd.
Jones & Glassco, Regd.
The William Kennedy & Sons, Ltd.

Cyanide:

Cyanide Plant Equipment:
The Dorr Co.
The Mine & Smelter Supply Co.

Diamond Drill Contractors:
Smith & Travers
Sullivan Machinery Co.

Diesel Engines:
Belliss & Morcom, Ltd.
Canadian Fairbanks-Morse Co., Ltd.
Laurie & Lamb.
Lammers & Maase, Ltd.

Dies:
Canada Foundries & Forgings, Ltd.
Herbert, Alfred, Limited.
Hull Iron & Steel Foundries, Ltd.
Holman Bros., Ltd.

Dredging Ropes:
Allan Whyte & Co.
Greening, B. Wire Co., Ltd.

Dredges:
Canadian Mead-Morrison Co.

Dredger Pins:
Hull Iron & Steel Foundries, Ltd.

Dredging Machinery:
Hadfields, Limited.
Hull Iron & Steel Foundries, Ltd.

Drills — Air and Hammer:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd
Herbert, Alfred, Ltd.
Holman Bros., Ltd.
Sullivan Machinery Co.
The Mine & Smelter Supply Co.

Drills — Core:
Canadian Ingersoll-Rand Co., Ltd.
Herbert, Alfred, Limited
Holman Bros., Ltd.
Sullivan Machineery Co.

Drill Steel Furnaces:
Canadian Ingersoll-Rand Co., Ltd.
Denver Rock Drill Mfg. Co.
Herbert, Alfred, Limited
Holman Bros., Ltd.
Sullivan Machinery Co.

Drills — Diamond:
Sullivan Machinery Co.

Drill Steel — Mining:
Canadian Ingersoll-Rand Co., Ltd..
Hadfields, Limited
Mussens, Limited

Drill Steel Sharpeners:
Canadian Ingersoll-Rand Co., Ltd.

Drills — Electric:
Canadian Fairbanks-Morse Co., Ltd.
Herbert, Alfred, Limited
Holman Bros. Ltd.
Sullivan Machinery Co.
Northern Electric Co., Ltd.

Drills — High Speed and Carbon:
Canadian Fairbanks-Morse Co., Ltd.
Hadfields, Limited
Herbert, Alfred, Limited
Holman Bros, Ltd.

Ejectors:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd.

Electric Condensers:
Griswold & Co.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Herbert, Alfred, Limited
Holman Bros., Limited
Northern Canada Supply Co.

Electric Hoists:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Mead-Morrison Co.

Elevators:
Dodge Manufacturing Co.
Canadian Machinery Co.
Sullivan Machinery Co.
Link-Belt Limited.
Northern Canada Supply Co.
Hadfields, Limited.
Jones & Glassco (Regd.).

Engineering & Surveying Instruments:
Laurie & Lamb.

Engines — Ventilating:
Canadian Sirocco Co., Ltd.

Engines, Diesel:
Canadian Fairbanks-Morse Co., Ltd.
Bellis & Morcom Ltd.
Laurie & Lamb
Lammers & Maase, Ltd.

Engines — Gas and Gasoline:
Canadian Fairbanks-Morse Co., Ltd.
Belliss & Morcom, Ltd.
Sullivan Machinery Co.
Gould, Shapely & Muir Co., Ltd
Laurie & Lamb.
The Mine & Smelter Supply Co
Powley & Moody, Limited.

Engines — Haulage:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Powley & Moody, Limited.

Engines — Steam:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Laurie & Lamb.

Engineers:
Dresser, John A.
Dorr Co.
Ferrier, W. F.
Hore, R. E.
Heves & Sons, Thos.
Hersey Co. Ltd., Milton
McEvoy, James C.
Rogers, George R.
Ross, Jas. G.
Stewart, Robert H.
Tyrell, J. B.
Whitman, Alfred B.
Wilson, Ridgeway R.

Exhauster:
Canadian Sirocco, Ltd.

Ferro-Alloys (all Classes):
Canadian Steel Foundries, Ltd

Fire Fighting Supplies:
Canadian Fairbanks-Morse Co., Ltd.
Gutta Percha & Rubber, Ltd.

Flood Lamps:
Northern Electric Co., Ltd.

Flotation Oil:
Hercules Powder Co.

Fluorspar:
Consolidated Mining & Smelting Co.
Everitt & Co.

Forging:
Canada Foundry & Forging, Ltd.
Herbert, Alfred, Limited
Holman Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
Smart-Turner Machine Co.

Friction Clutches:
Canadian Fairbanks-Morse Co., Ltd.
Dodge Manufacturing Co.

Frogs: — See Switches & Turntables
Canadian Steel Foundries, Ltd.
Hull Iron & Steel Foundries.
John J. Gartshore.

Furnaces — Assay:
Lymans, Limited.
Mine & Smelter Supply Co.

Gasoline Extraction Compressors:
Canadian Ingersoll-Rand Co., Ltd.
Sullivan Machinery Co.

Gasoline Tanks — See Tanks:
Can. Chicago Bridge & Iron Co., Ltd
Horton Steel Works, Ltd.
Hendrick Manufacturing Co.

Gaskets:
Gutta Percha & Rubber, Ltd.

Gears:
Hans Renold of Canada, Ltd.
Jones & Glassco, Regd.
The William Kennedy & Sons, Ltd.

Gears (Cast):
Link-Belt Limited.
The William Kennedy & Sons, Ltd
Hull Iron & Steel Foundries, Ltd.

Gears: Machine Cut:
The Hamilton Gear & Machine Co.
The William Kennedy & Sons, Ltd.

Gold Refiners:
Goldsmith Bros.

Gold Pans:
Can. Chi. Bridge & Iron Works, Ltd
Horton Steel Works, Ltd.

Grab-Buckets:
Canadian Mead-Morrison Co.

Hangers:
Canadian Fairbanks-Morse Co., Ltd.
Dodge Manufacturing Co.

Hose:
Canadian Fairbanks-Morse Co., Ltd.
Goodyear Tire & Rubber Co.
Gutta Percha & Rubber, Ltd.
Dunlop Tire & Rubber Co.

Hangers and Cables:
Stan. Underground Cable Co., Ltd.

Heating Systems:
Canadian Sirocco Co., Ltd.

High Speed Steel:
Hadfields, Ltd.

Hoists — Air, Electric and Steam:
Canadian Ingersoll-Rand Co., Ltd.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Dodge Manufacturing Co.
Herbert, Alfred, Ltd.
Holman Bros., Ltd.
Jones & Glassco, Regd.
Mine & Smelter Supply Co.
Link-Belt Limited.
Peacock Bros., Ltd.
Sullivan Machinery Co.

Hoisting Towers:
Canadian Mead-Morrison Co.

Hoppers:
Dodge Manufacturing Co.

Hydraulic Machinery:
Hadfields, Ltd.
Belliss & Morcom, Ltd.
Laurie & Lamb.
The William Kennedy & Sons, Ltd.

Industrial Chemists & Inspectors:
Hersey, M. & Co., Ltd.

Insulating Compounds:
Standard Underground Cable Co.

Jacks:
Canadian Fairbanks-Morse Co., Ltd.
Northern Canada Supply Co.

Jaw & Gyratory Crushers, See Crushers:

Lamp-Miners:
Northern Electric Co.
Peacock Bros., Ltd.
Powley & Moody, Limited.

Lead (Pig):
Consolidated Mining & Smelting Co.

Link Belt — See Chain Drives:

Locomotives (Steam Compressed Air and Storage):
Canadian Ingersoll-Rand Co., Ltd.
Laurie & Lamb.
Powley & Moody, Limited.

Machine Guards:
Greening, B. Wire Co., Ltd.

Magnesium Metal:
Hull Iron & Steel Foundries, Ltd.

Manganese Steel, See Steel, Manganese:
Canadian Steel Foundries, Ltd.
Hadfields, Ltd.

Metal Merchants:
Consolidated Mining & Smelting Co
C. L. Constant Co.

Metallurgical Engineers:
The Dorr Co.

Metallurgical Machinery:
Dwight & Lloyd Sintering Co
The Dorr Co.
The Mine & Smelter Supply Co.

Metal Work, Heavy Plates:
Can. Chicago Bridge & Iron Co., Ltd
Horton Steel Works, Ltd.
Hendrick Manufacturing Co.
The William Kennedy & Sons, Ltd.
Powley & Moody, Limited.

Mica:
Everitt & Co.

Mine Cars — See Cars, Mine:
The William Kennedy & Sons, Ltd
Powley & Moody, Limited.

Mining Engineers:
Hersey, M. & Co., Ltd.

Mining Requisites:
Dominion Wire Rope Co., Ltd
Hadfields, Limited.
Hull Iron & Steel Foundries, Ltd
Powley & Moody, Limited.

Mining Ropes — See Cable:

Mine Surveying Instruments:
C. L. Berger & Sons.

Molybdenite:
Everitt & Co.

Motors:
Canadian Fairbanks-Morse Co., Ltd.
Peacock Brothers, Ltd.
Powley & Moody, Limited.

Motor Pulleys:
Canadian Fairbanks-Morse Co., Ltd.
Dodge Manufacturing Co.

Nickel:
The Mond Nickel Co., Ltd.

Oil Engines — Reverse:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd.

Oil Storage Tanks — See Tanks:
Can. Chicago Bridge & Iron Co., Ltd
Horton Steel Works, Ltd.
Hendrick Manufacturing Co.
The Toronto Iron Works, Ltd

Ore Handling Equipment:
Link-Belt Limited.
Canadian Mead-Morrison Co.
Herbert, Alfred, Limited.

Ore Sacks:
Northern Canada Supply Co.

Ore Testing Works: See Assayers & Chemists:

Ores & Metals—Buyers & Sellers of:
Geo. G. Blackwell.
Consolidated Mining & Smelting Co.
Everitt & Co.

Oils:
Hercules Powder Co.

Pavers:
Wettlaufers Brothers.
Gutta Percha & Rubber, Ltd
Laurie & Lamb.

Perforated Metals:
Hendrick Mfg. Co.
Canada Wire & Iron Goods Co
Greening, B. Wire Co.

Pillow Blocks:
Canadian Fairbanks-Morse Co., Ltd
Canadian Link-Belt Co., Ltd.

Pipes:
Canadian Fairbanks-Morse Co., Ltd
Consolidated Mining & Smelting Co
The William Kennedy & Sons, Ltd

Pipe — Wood Stave:
Pacific Coast Pipe Co.
Mine & Smelter Supply Co.
Canadian Ingersoll-Rand Co., Ltd

Piston Rock Drill—see Drills, Air & Hammer:

Plate Works:
Can. Chi. Bridge & Iron Co., Ltd
Hendrick Mfg. Co.
The William Kennedy & Sons, Ltd
Horton Steel Works, Ltd.

Platinum Refiners:
Goldsmith Brothers.

Pneumatic Tools:
Canadian Ingersoll-Rand Co., Ltd
Herbert, Alfred, Limited.
Holman Bros., Ltd.

Portable Column Hoists: see
Canadian Ingersoll-Rand Co., Ltd
Denver Rock Drill Mfg. Co
Herbert, Alfred, Limited
Holman Bros., Ltd.
Sullivan Machinery Co.

Poultry Netting:
Greening, B. Wire Co., Ltd.

Power Factor Correcting Devices:
Griswold & Co.

Power Condensers:
Griswold & Co.

Prospecting Mills & Machinery:
Mine & Smelter Supply Co.

Pulleys Shafting and Hangers:
Canadian Fairbanks-Morse Co., Ltd.
Dodge Manufacturing Co.
The William Kennedy & Sons Ltd

Pulleys — Iron, Steel, Wood Split:
Dodge Manufacturing Co.
Canadian Fairbanks-Morse Co., Ltd.

Pulverizers — Laboratory:
Herbert, Alfred, Limited
Holman Bros., Ltd.
Mine & Smelter Supply Co

Pumps — Pneumatic:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd
Smart-Turner Machine Co
Sullivan Machinery Co

Pumps — Steam:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd
Northern Canada Supply Co
Peacock Brothers, Ltd.
Smart-Turner Machine Co

Pumps-Turbines:
Canadian Fairbanks-Morse Co., Ltd
Smart-Turner Machine Co.
Canadian Ingersoll-Rand Co., Ltd
Laurie & Lamb.
Peacock Brothers, Ltd.

Pumps-Vacuum:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd
Smart-Turner Machine Co
Peacock Brothers, Ltd.

Pumps — Boiler Feed:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd
Peacock Brothers, Ltd.

Pumps — Centrifugal:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd
Laurie & Lamb.
Peacock Brothers, Limited
Smart-Turner Machine Co.

Pumps — Diaphragm:
Canadian Fairbanks-Morse Co., Ltd
The Dorr Company.
The William Kennedy & Sons Ltd

Pumps — Electric:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd
Laurie & Lamb.
Peacock Brothers, Ltd
Smart-Turner Machine Co

Pumps — Sand & Slime:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd
Laurie & Lamb.
Mine & Smelter Supply Co
Sylvester Mfg. Co., Ltd

Pumps — Valves:
Canadian Fairbanks-Morse Co., Ltd
Peacock Brothers, Ltd

Push Cars — See Cars, Push:
Canadian Fairbanks-Morse Co., Ltd
Powley & Moody, Limited.

rrying Machinery:
anadian Ingersoll-Rand Co., Ltd.
anadian Rock Drill Co.
enver Rock Drill Mfg. Co., Ltd.
erbert, Alfred, Limited.
olman Bros., Ltd.
ullivan Machinery Co.

lls:
odge Manufacturing Co.

ls:
anadian Fairbanks-Morse Co., Ltd.
adfields, Limited.
ohn J. Gartshore.
owley & Moody, Limited.

iners:
oldsmith Brothers

dles:
endrick Mfg. Co.

l Mills:
ine & Smelter Supply Co.

l Shells:
he William Kennedy & Sons, Ltd.
anadian Steel Foundries, Ltd.

ls — Crushing:
anadian Ingersoll-Rand Co., Ltd.
adfields, Limited.
ull Iron & Steel Foundries, Ltd.
erbert, Alfred, Ltd.
olman Bros. Ltd.
Vettlaufer Bros.

ler Chain:
lans Renold of Canada, Ltd.
ink-Belt Limited.
ones & Glassco, Regd.

pe — Manilla & Jute:
odge Manufacturing Co.
ones & Glassco, Regd.
llan, Whyte & Co.

pe — Wire:
anadian Fairbanks-Morse Co., Ltd.
nglo Canadian Wire Rope Co.
llan, Whyte & Co., Ltd.
anada Wire & Cable Co.
anada Wire & Iron Goods Co.
odge Manufacturing Co.
ominion Wire Rope Co., Ltd.
reening, B. Wire Co.

pe Transmission Equipment:
odge Manufacturing Co.

ine Refiners:
oldsmith Brothers

nplers:
anada Metal Co.
edoux & Co.
ilton Hersey Co.
hos. Heyes & Son.
ine & Smelter Supply Co.

reens:
anadian Ingersoll-Rand Co., Ltd.
reening, B. Wire Co.
lendrick Mfg. Co.
anada Wire & Iron Goods Co.

reens — Cross Patent Flanged Lip:
lendrick Mfg. Co.

reens — Perforated Metal:
lendrick Mfg. Co.

reens Shaking:
ink-Belt Limited.
lendrick Mfg. Co.

reens — Revolving:
Link-Belt Limited.
lendrick Mfg. Co.
The William Kennedy & Sons, Ltd.

parators:
Smart-Turner Machine Co.
Mine & Smelter Supply Co.

er Pipes:
Wettlaufer Bros.

afting:
Canadian Fairbanks-Morse Co., Ltd.
Dodge Manufacturing Co.

eet Metal Work:
Hendrick Mfg. Co.

eaves:
Dodge Manufacturing Co.

eets — Genuine Manganese Bronze:
Hendrick Mfg. Co.

eets and Dies:
Hull Iron & Steel Foundries, Ltd
Peacock Brothers, Ltd.
The William Kennedy & Sons, Ltd

ip Loaders: see Conveyors
Canadian Mead-Morrison Co.

ient Chain: See Chain Drives
Powley & Moody, Limited.

Silent & Steel Roller—See Roller Si
lent Steel.

edges:
Canada Foundries & Forgings.

eeves:
Dodge Manufacturing Co.

ntering:
Dwight & Lloyd Sintering Co., Inc.

uelters:
Goldsmith Bros.

noke Stacks:
Can. Chicago Bridge & Iron Co., Ltd
Horton Steel Works, Ltd.
Hendrick Mfg. Co.
The William Kennedy & Sons, Ltd

Special Machinery:

Spelter:
The William Kennedy & Sons, Ltd.
Consolidated Mining & Smelting Co.

Sprockets:
Canadian Fairbanks-Morse Co., Ltd.
Hans Renold of Canada, Ltd.
Canadian Fairbanks Morse Co., Ltd.
Dodge Manufacturing Co.
Link-Belt Limited.
Jones & Glassco, Regd.
The William Kennedy & Sons, Ltd.

Spring Coil & Clips Electric:
Canadian Steel Foundries, Ltd.

Stamp Batteries:
Herbert, Alfred, Limited.
Holman Bros., Ltd.

Stamp Forgings:
Canada Foundries & Forgings, Ltd.
Hull Iron & Steel Foundries.

Steel Barrels:
Smart-Turner Machine Co.

Steel Castings:
Canadian Steel Foundries, Ltd.
Canadian Brakeshoe Co., Ltd.
Hull Iron & Steel Foundries, Ltd.
Hadfields, Ltd.
The William Kennedy & Sons, Ltd.
Denver Rock Drill Mfg. Co., Ltd.
Sullivan Machinery Co.
Peacock Brothers Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Canadian Mead-Morrison Co.

Steam Hoisting Engines:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Mead-Morrison Co.

Steel Drums:
Smart-Turner Machine Co

Steel Manganese:
Hadfields Ltd.
Hull Iron & Steel Foundries Ltd.
Canadian Steel Foundries, Ltd.

Steel Plate Construction — Light and Heavy:
Hendrick Mfg. Co.
The William Kennedy & Sons, Ltd.

Steam Engines — See Engines Steam:
Steam Traps:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Sirocco Co., Ltd.
Laurie & Lamb.

Steel-Tool:
N. S. Steel & Coal Co.
Hadfields, Limited.

Stone Breakers:
Holman Brothers, Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Denver Rock Drill Mfg. Co.
Herbert, Alfred, Limited.

Stone Quarrying Machinery:
Canadian Ingersoll-Rand Co., Ltd.
Denver Rock Drill Mfg. Co.
Sullivan Machinery Co.

Structural Steel Work — Light:
Hendrick Mfg. Co.
The William Kennedy & Sons, Ltd

Sulphate of Copper:
The Mond Nickel Co., Ltd.

Surveying Instruments:
C. L. Berger.

Switches:
Canadian Steel Foundries, Ltd.

Tables — Concentrating:
Mine & Smelter Supply Co.

Tanks:
Hendrick Manufacturing Co.

Tanks — Acid:
Hendrick Manufacturing Co.
Ontario Wind Engine & Pump Co.

Tanks — Wooden:
Gould, Shapley, & Muir Co., Ltd.
Ontario, Wind Engine & Pump Co.
Pacific Coast Pipe Co., Ltd.
Mine & Smelter Supply Co.

Tanks, Cyanide, Etc.:
Hendrick Mfg. Co.
Ontario Wind Engine & Pump Co.
Pacific Coast Pipe Co.

Tanks — Steel:
Canadian Ingersoll-Rand Co., Ltd.
Hendrick Mfg. Co.
The William Kennedy & Sons, Ltd.

Tanks — Oil Storage:
Hendrick Manufacturing Co.

Tanks — Water & Steel Towers:
Hendrick Manufacturing Co.
Ontario Wind Engine & Pump Co. Ltd

Tires — Auto, Truck and Bicycle:
Canada Foundry & Forgings, Lt
Gutta Percha & Rubber, Ltd.
Hadfields, Ltd
Powley & Moody, Limited.

Track, Manganese Steel:
Canadian Steel Foundries, Ltd.

Trackworks — (Manganese-Steel):
Hull Iron & Steel Foundries, Ltd.
Canadian Steel Foundries, Ltd.

Tramway Points & Crossings:
Hadfields, Limited.

Transformers:
Northern Electric Co., Ltd.

Transmission Appliances:
Canadian Fairbanks-Morse Co., Ltd.
Jones & Glassco, Regd.

Transmission Machinery:
Canadian Fairbanks-Morse Co., Ltd.
Link-Belt Limited.
Hans Renold of Canada, Ltd.
Jones & Glassco, Regd.
The William Kennedy & Sons, Ltd.

Trippers:
Dodge Manufacturing Co.

Troughs (Conveyor):
Hendrick Mfg. Co.

Trucks:
Hammant Steel Car & Eng. Works.

Tubs:
Hadfields, Limited.
Powley & Moody, Limited.

Tube Mills:
Canada Foundries & Forgings, Ltd.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
The William Kennedy & Sons, Ltd.
Mine & Smelter Supply.

Tube Mill Balls:
Canada Foundries & Forgings, Ltd.
Holman Bros., Ltd.
Herbert, Alfred, Limited.
Hull Iron & Steel Foundries, Ltd.
Peacock Brothers, Ltd.
The William Kennedy & Sons, Ltd.

Tube Mill Liners:
Turbines — Waterwheel:
Turbines — Steam:
Laurie & Lamb.
The William Kennedy & Sons, Ltd.

Turbines:
Belliss & Morcom, Ltd.
Laurie & Lamb.
Herbert, Alfred, Limited.
Hull Iron & Steel Foundries, Ltd.
Peacock Brothers, Ltd.
The William Kennedy & Sons, Ltd.

Turbo Blowers & Compressors:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd.

Uranium:
Everitt & Co.

Vacuum Pumps — see Pumps, Vacuum:

Ventilating Systems:
Canadian Sirocco Co., Ltd.

Vises:
Canadian Fairbanks-Morse Co., Ltd.
The William Kennedy & Sons, Ltd.

Water Jet Drifting Drill:
Canadian Ingersoll-Rand Co., Ltd.
Sullivan Machinery Co.

Weights:
Dodge Manufacturing Co.

Wheels and Axles:
Hadfields, Limited.
The William Kennedy & Sons, Ltd.

Winches — Power Driven:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Mead-Morrison Co.

Winding Engines — Steam & Electric:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Herbert, Alfred, Limited.
Holman Bros., Ltd
Anglo-Canadian Wire Rope.
Canada Wire & Cable Co. Ltd.
Greening, B. Wire Co.

Wire:
Anglo-Canadian Wire Rope
Greening B., Wire Co.

Wire (Bare and Insulated):
Canada Wire & Cable Co., Ltd.
Standard Underground Cable Co. of Canada, Limited.

Wire Rope — see Cable:
Allan, Whyte & Co., Ltd.
Anglo Canadian Wire Rope.
Canada Wire & Iron Goods Co.
Dodge Manufacturing Co.
Dominion Wire Rope Co., Ltd.
Greening, B. Wire Co.
Northern Electric Co., Ltd.

Wire Rope Fittings:
Anglo Canadian Wire Rope.
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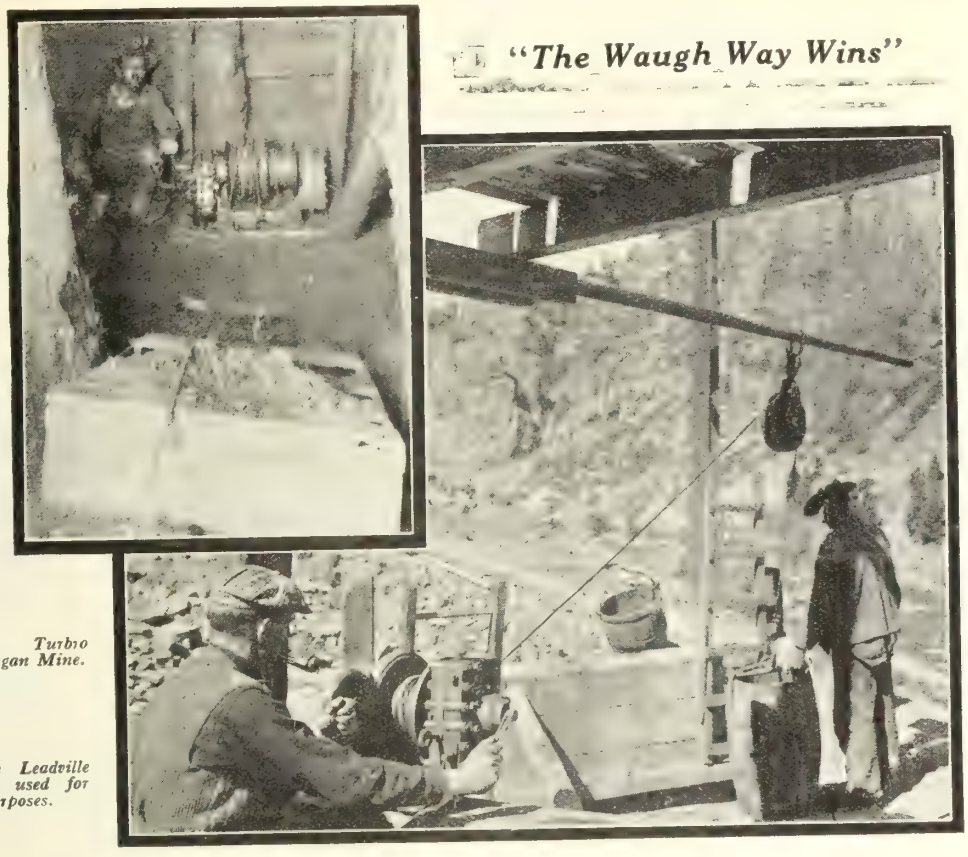

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Model 300 Turbro Waughoist in Michigan Mine.

Below

Showing the Leadville lumn Hoist being used for rface hoisting purposes.

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LEADVILLE column hoist (manufactured by The William A. Box Iron Works Company, of Denver, Colorado), have stood the test of long years of successful operation in mine and quarry and are now exclusively sold by this Company in conjunction with its Waughoist. Booklets descriptive of these machines will be sent upon request.

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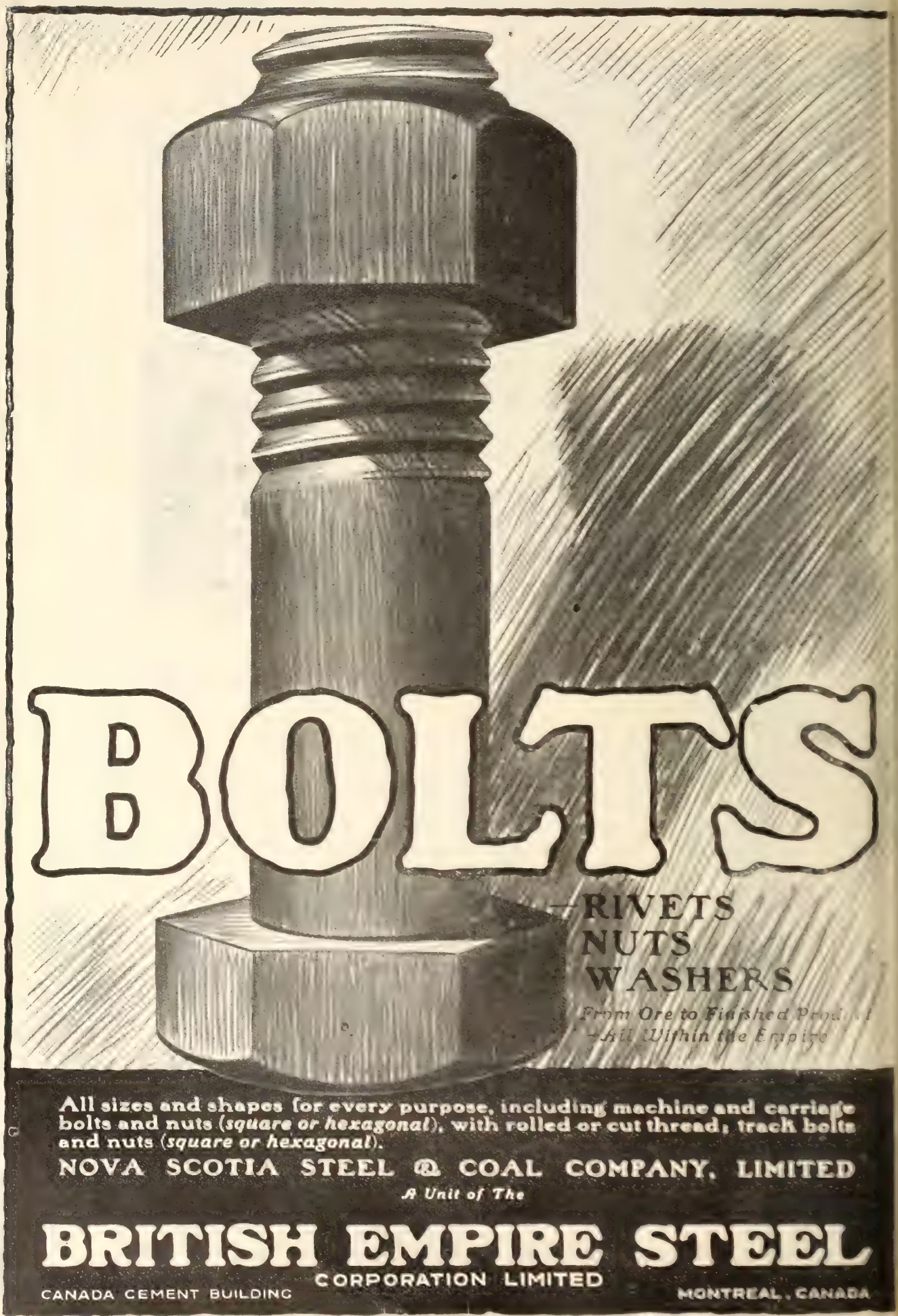
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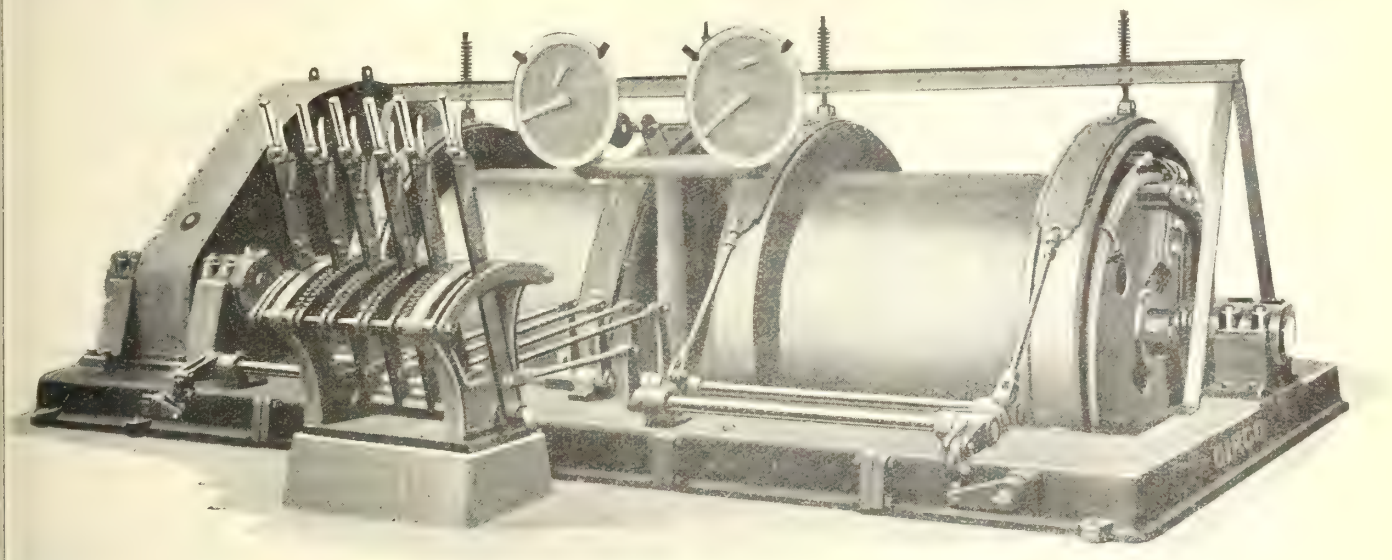

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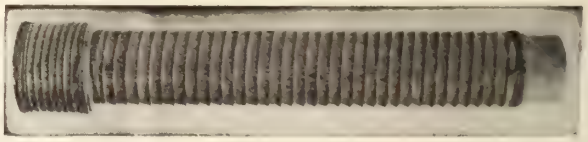

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Ontario's Minerals

PROVINCE OF ONTARIO

Hon. CHARLES. McCREA, Minister. DEPARTMENT OF MINES *Thos. W. Gibson*

Mineral Areas

Ontario, with its 407,262 square miles, contains many millions of acres in which the geological formations are favourable for the occurrence of minerals 70 per cent of the area being underlain by rocks of pre-Cambrian age. The phenomenally rich silver veins of Cobalt, Gowganda and South Lorrain occur in these rocks; so also do the far-famed nickel copper deposits of Sudbury, the gold of Porcupine and Kirkland Lake, and the iron ore of Magpie and Moose Mountain mines.

Economic Minerals

In addition to the above, practically all economic minerals (coal and tin excepted) are found in Ontario: — actinolite, apatite, arsenic, asbestos, cobalt, corundum, feldspar, fluorspar, graphite, gypsum, iron pyrites, lead, mica, molybdenite, natural gas, palladium, petroleum, platinum, quartz, salt, talc and zinc. This Province has the largest deposits on the continent of talc, feldspar, mica and graphite.

Building materials, such as ornamental marble, limestone, sandstone, granite, trap, sand and gravel, lime, Portland cement, brick and tile, meet every demand.

Mineral Production

Preliminary returns show the output of the mines and metallurgical works of the Province for the year 1922 to be worth $62,202,169, of which the metallic production was $38,190,711.

The following figures show the growth of Ontario's mineral industry by five-year periods since 1891 when a Bureau of Mines was first established.

Year.	Value.	Year.	Value.
1891	$4,705,672	1911	$41,976,797
1896	5,235,003	1916	65,303,822
1901	11,831,086	1918 (Maximum war output)	80,308,972
1906	22,388,383	1921	48,128,387

Dividends and bonuses paid to the end of 1922 amounted to $28,096,699 for gold mining companies, and $86,238,185 for silver mining companies or a total of $114,334,884.

Mining Regulations

A miner's license costs $5.00 per annum, and entitles the holder to stake out in any or every mining division three claims of 40 acres each. After performing 200 days' assessment work on a claim, patent may be obtained from the Crown on payment of $2.50 or $3.00 per acre, depending on location in unsurveyed or surveyed territory.

Assay Office

The Provincial Assays Office at No. 5 Queen's Park, Toronto, is maintained by the Department of Mines for the free identification of minerals, free assays under the provisions of the Mining Act of Ontario, and also for general assay work as per the Schedule of Charges which may be obtained on application.

Temiskaming Testing Laboratories

The Department maintains, at Cobalt, an ore sampling and testing laboratory which is now prepared to receive parcels of gold ore from 100 pounds upward, and after sampling and assaying the same to pay to the shipper the value thereof, less treatment charges. The purpose is to afford a market for ores extracted by prospectors and others in developing their mining claims, enabling them to obtain funds which they can use for further work and to report on the most satisfactory method of treatment. Fuller information may be obtained on application to the Manager, Temiskaming Testing Laboratories, Cobalt, Ontario.

Publications

For list of publications, illustrated reports, geological maps and mining laws, apply to

Thos. W. Gibson,
Deputy Minister of Mines,
TORONTO, CANADA

BRITISH COLUMBIA

The Mineral Province of Western Canada

as produced Minerals valued as follows: Placer Gold, $76,542,203; Lode Gold, $109,647,661; Silver, $59,-4,266; Lead, $51,810,891; Copper, $170,723,242; Zinc, $24,625,853; Coal and Coke, $238,289,565; Building one, Brick Cement, etc., $36,605,942; Miscellaneous Minerals, $1,358,839; Making its mineral production the end of 1922 show an

Aggregate Value of $769,418,462

The substantial progress of the Mining Industry of this Province is strikingly exhibited in the following gures, which show the value of production for successive five-year periods: For all years to 1895, inusive $94,547,241; for five years, 1896-1900, $57,607,967; for five years, 1901-1905, $96,509,968; for five ears, 1906-1910, $125,534,474; for five years, 1911-1915, $142,072,603; for 5 years, 1915-1920, $189,922,725, 921, $28,066,641; for the year 1922, $35,158,843.

Production During last ten years, $339,280,940

Lode-mining has only been in progress for about twenty-five years, and not 20 per cent. of the Provnce has been even prospected; 300,000 square miles of unexplored mineral bearing land are open for prosecting.

The Mining Laws of this Province are more liberal and the fees lower than those of any other Province n the Dominion, or any Colony in the British Empire

Mineral locations are granted to discoverers for nominal fees.

bsolute Titles are obtained by developing such properties, the security of which is guaranteed by Crown rants.

Full information, together with Mining Reports and Maps, may be obtained gratis by addressing.

VICTORIA, British Columbia

THE HON. THE MINISTER OF MINES

PROVINCE OF QUEBEC

MINES BRANCH

Department of Colonization, Mines and Fisheries

The chief minerals of the Province of Quebec are Asbestos, Chromite, Copper, Iron, Gold, Molybdenite, Phosphate, Mica, Graphite, Ornamental and Building Stone, Clays, etc.

The Mining Law gives absolute security of Title and is very favourable to the Prospector.

MINER'S CERTIFICATES. First of all, obtain a miner's certificate, from the Department in Quebec or from the nearest agent. The price of this certificate is $10 and is valid until the first of January following. This certificate gives the right to prospect on public lands and on private lands, on which the mineral rights belong to the Crown.

The holder of the certificate may stake mining claims to the extent of 200 acres

WORKING CONDITIONS. During the first six months following the staking of the claim, work on it must be performed to the extent of at least twenty-five days of eight hours.

SIX MONTHS AFTER STAKING. At the expiration of six months from the date of the staking, the prospector, to retain his rights, must take out a mining license.

MINING LICENSE. The mining license may cover 40 to 200 acres in unsurveyed territory. The price of this license is Fifty Cents an acre per year, and a fee of $10.00 on issue. It is valid for one year and is renewable on the same terms, on producing an affidavit that during the year work has been performed to the extent of at least twenty-five days' labour on each forty acres.

MINING CONCESSION. Notwithstanding the above, a mining concession may be acquired at any time at the rate of $5 an acre for SUPERIOR METALS, and $3 an acre for INFERIOR MINERALS

The attention of prospectors is especially called to the territory in the North-Western part of the Province of Quebec north of the height of land, where important mineralized belts are known to exist.

PROVINCIAL LABORATORY. Special arrangements have been made with POLYTECHNIC SCHOOL of LAVAL UNIVERSITY, 228 ST. DENIS STREET, Montreal, for the determination, assays and analyses of minerals at very reduced rates for the benefit of miners and prospectors in the Province of Quebec. The well equipped laboratories of this institution and its trained chemists ensure results of undoubted integrity and reliability.

The bureau of Mines at Quebec will give all the information desired in connection with the mines and mineral resources of the Province, on application addressed to

HONORABLE J. E. PERRAULT,

MINISTER OF COLONIZATION, MINES AND FISHERIES, QUEBEC

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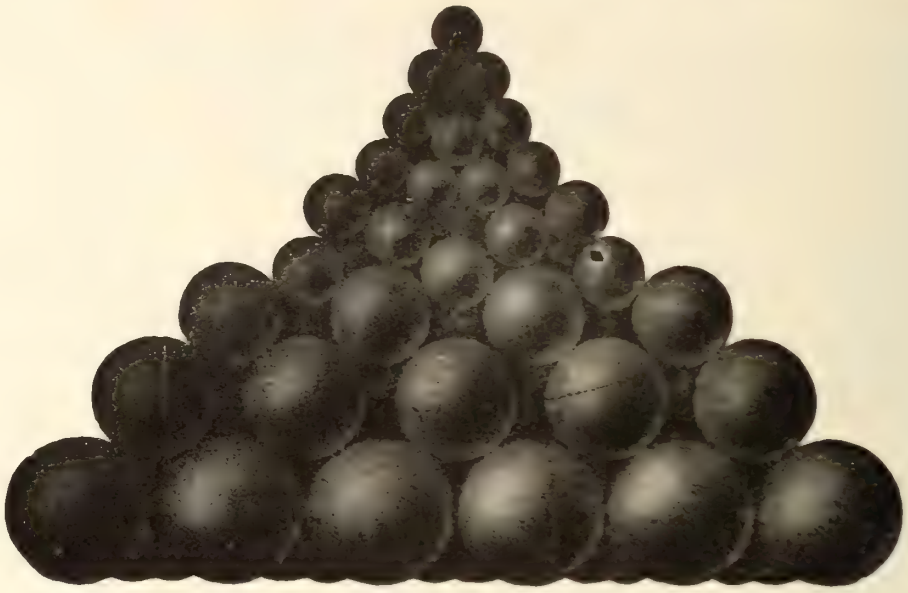

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The Editor cordially invites readers to submit articles of practical interest which, on publication, will be paid for.

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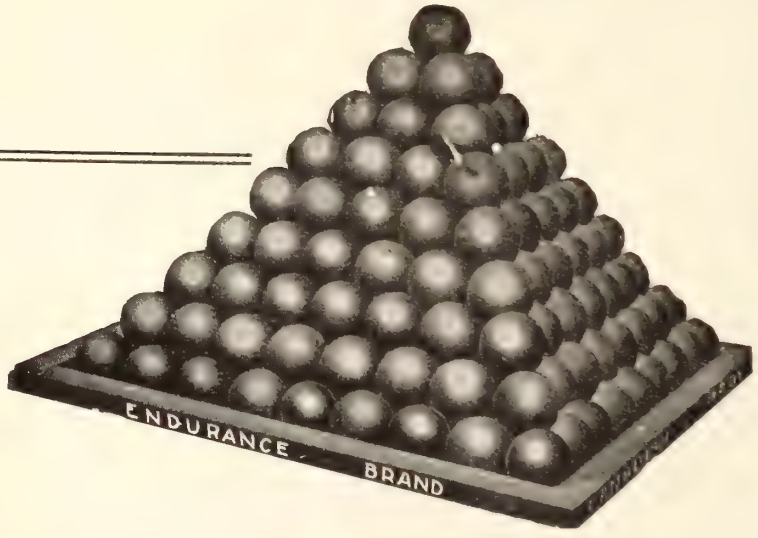

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:-: EDITORIAL :-:

WANTED — MORE UNITY IN OUR MINING INDUSTRY

The mining industry of Canada is coming more and more under the scrutiny of visitors from Great Britain and foreign countries who are interested in its development and exploitation, its products and its personnel. Our mining industry, like our country itself, has assumed national importance, and should be directed from a national point of view. We are now fully conscious that Canada has reached nationhood. Is her mining industry a national unit before the world? We fear it is not.

So far as we are aware, the only truly national representative of Canada's mineral industry (excluding ourselves!) is the Canadian Institute of Mining and Metallurgy. The technical personnel of the industry has effected a nation-wide organization and its influence extends from coast to coast. It is this national institution that provides the avenue of approach to Mr. Hugh F. Marriott on his mission from Great Britain. He is to visit each of the Institute's branches from Pacific to Atlantic, and no doubt will gain an impression of Canadian mining engineers united in a common cause, whatever the divergence of opinion may be on the various questions to be discussed.

To outsiders who approach our mining industry by any road other than the Institute, it will present, we fear, a dis-united and heterogeneous appearance. Apart from the prairie provinces, whose mineral resources still continue to be administered by the Federal government, the provincial governments formulate and administer the mining laws and policies. Though there is some semblance of similarity in the fact that they all attempt to conform to the ideals of democratic government and of British justice, there is little else that is common to them. The mineral resources of the eight provinces (for "The Island" has no mining industry as yet) are administered under laws more divergent than those of Canada and some foreign countries. There is at present no serious attempt to shape policies according to a common standard, acceptable to all. There is plenty of common ground on which the federal government and those of the provinces stand; but up to the present our political administrators have failed to consult one another with a view to marking it out.

It appears to us that the present is an opportune time to make a move towards unity. Those responsible to the public for our mineral resources from coast to coast might well confer on this subject. Of all our basic industries, mining is at present the most active and the most prosperous, and its growth during the next few years promises to bring it to a position of much greater relative importance to the country. The policies and laws under which the mineral resources are administered are among the most important factors affecting their development, particularly on account of their influence on investors. The heterogeneous character of the present sectional laws is bound to confuse the investor, as well as others from outside who have not been brought up to take for granted their variety and their complexity. In many cases this diversity is more the result of accident than of design. In other cases a compromise between divergent views will be much better than either extreme. In any case, the matter is worth close consideration by the combined forces of the federal and provincial Departments of Mines.

We make this suggestion knowing that it is likewise in the minds of a number of the leaders of our mining industry, and confident that prompt action will ensue should the idea commend itself to our public administrators.

MR. WOLVIN ANNOUNCES PENSION PLAN

Mr. R. M. Wolvin, President of British Empire Steel Corporation, announced last week the inauguration of a pension fund, details of which are recorded today by our Nova Scotia correspondent. In announcing the scheme, Mr. Wolvin said he had had it in mind ever since he became president of the new corporation in 1920. In our opinion it marks definitely a breadth of outlook and a soundness of principle that is well worthy of this, one of the greatest of Canadian industrial corporations.

A notable feature of the new pension scheme is that its cost is borne entirely by the Corporation. While a coöperative pension fund has certain advantages, it presupposes a spirit of thrift that often is found not to exist generally among the workmen.. In the present case the antagonism between workmen and employers exemplified in the recent strikes makes the scheme as formulated even more advisable. Mr. Wolvin and his directors have chosen wisely a course that should go a long way towards winning over the workers of Cape Breton to the loyal service of their employers.

It is mooted in Sydney also that the Corporation shortly will offer to its employees an opportunity to buy preferred stock under conditions advantageous to themselves. This plan has had such excellent results for both workmen and employers in the case of a number of substantial companies in this country, as well as abroad, that its adoption in Sydney might well prove of decided advantage to all concerned.

SURTAX ON GOLD MINING PROPOSED

The Minister of Finance at Ottawa has proposed that a surtax be levied on gold mines in Canada. This is the tenor of his recent announcement that the embargo on the export of Canadian gold is to continue, but that the premium obtainable by selling this gold in the United States shall be retained by the government instead of being turned over to the mining companies. Mr. Fielding upholds his stand by saying that the mining companies are prosperous and can well afford to contribute this additional sum towards balancing the budget. . The estimated amount of the surtax this year is $500,000. We doubt if Mr. Fielding has gauged accurately the cost of raising this half million dollars.. In our estimation it is likely to cost the country much more than the amount raised.

Hon. Charles McCrea, Minister of Mines for Ontario, has pointed out repeatedly and forcefully the fact that the security of capital invested in the mining industry in Canada is one of the chief attractions we can offer investors, particularly foreign investors. Stable laws, liberal regulations and consistent policies are an asset of no mean dimensions to a young country like ours, necessarily dependent in part upon the stored-up energy represented by British and foreign capital for the rapid development of our resources. Ministers of he Crown and other responsible public servants in other provinces have voiced the same sentiment. All realize the value of security to investors, and each has adopted means of ensuring it.

Now Mr. Fielding proposes an impost that will assuredly tend to destroy the feeling of confidence and security that others have been at such pains to build up. The tax is not heavy; but what will be the next move in the same direction? This will set a precedent for the federal taxation of a provincial resource; how much further can the idea be developed to help fill the empty treasury at Ottawa? The youthful gold mining industry is prosperous and the established mines are yielding handsome revenues to their owners and to the provinces; are there other melons as well from which the Dominion can cut a slice?

We should bear it in mind constantly that, though we have now a number of well-established gold mines, all evidence points to the fact that there will be many more of them during the succeeding years. How large our gold mining industry will be eventually, we can only guess. It is now only an "infant industry", and in its estate of manhood it may be a source of national income that will make Mr. Fielding's proposed $500,000 tax look small. Its growth will depend largely upon the capital fed to it. It will be a dangerous experiment to trifle with this infant's nourishment in such a way as may retard and stunt its growth.

Mr. Fielding's proposed impost on the gold mining industry is dangerous, as it infringes upon principle that should be held inviolate. It is inexpedient, because the amount of money it is proposed to raise for the federal treasury by this means is not commensurate with the risk of injury to the industry it involves.

NEW ROAD FOR QUEBEC GOLD-FIELD

Hon. J. E. Perrault, Minister of Mines at Quebec has authorized the immediate construction of a winter road into the gold district of northwestern Quebec from the south, and has promised that this winter road shall be made into a summer road next season. As the minimum cost as estimated at present by the Minister is $200,000, he and his colleagues obviously intend to provide a permanent and well built road for the use of the prospectors, miners and settlers who will develop the combined mineral and agricultural resources of this important area.

The new road will commence at Angliers, the present northern terminus of the Kipawa-Des Quinze branch of the Canadian Pacific Railway at the Quinze storage dam, and will run northward for a distance of forty miles on a location made recently by Mr. Normandeau of the engineering staff at Quebec, to Boischatel township. Its course will be through the fine clay land west of Des Quinze and Barriere lakes and east of Lake Opasatika, crossing mid-way the Lonely river, which joins the last two lakes. At a suitable point in Boischatel township a branch road will be constructed westward to Lake Fortune, and another eastward into Rouyn township, with the Noranda camp as its present terminus. It is expected the winter road will be ready for use by the end of December.

As mentioned before in these pages, the gold belt of northwestern Quebec stretches along the southern edge of the Great Clay Belt for one hundred miles, and a lobe of the belt extends southward to Ville Marie. The new road will run through the centre of this lobe of agricultural land for a distance of forty miles, and its projected branches in Boischatel and Rouyn townships will serve a large area of excellent clay land as well as the prospective mines. The route chosen is also that which an extension of the railway from Angliers will naturally follow, so that its construction in the future (possibly in the near future) will be preceded to some extent by the settlement upon which its ultimate solvency will depend. If the

present gold prospects at Noranda and Lake Fortune should turn into mines (and there is every reason to believe they will), then the cost of the new road, and indeed of the railway as well, will be insignificant compared with the bullion that will be shipped over them, and settlement round the mines will proceed at a rapid pace.

We have also noticed before in these columns the fact that, once convinced of the wisdom and expediency of a course of action, the political administrators at Quebec are known for swift, decisive and thorough practical measures. Mr. Perrault's decision to build this road illustrates well this point. It is less than six months since the two finds were made upon which our hopes for the immediate future of the district are centred. Their development during the coming winter warrants the provision of a road, and Mr. Perrault and his associates have decided promptly to provide it. It is more than likely that the winter's work will demonstrate the necessity of a summer road, and adequate provision has been made for it. Meantime, the amounts to be expended are amply covered by the benefit that will be derived from the road as an agency of colonization.

The *Canadian Mining Journal* wishes to congratulate Mr. Perrault and his colleagues upon their well-judged and timely decision. It will provide an invaluable aid to those whose time, energies and money are being used without stint to prove the gold-field of northwestern Qeubec.

THE QUINZE AND THE ONTARIO-QUEBEC MINERAL BELT

At present there is plenty of power for the mines and mills of Northern Ontario. If the coming winter season should prove unfavourable, there may be a recurrence of power shortage during the winter, but it is not at all likely it will be so serious as that of last winter. Before the next normal season of low water, in the winter of 1924-25, the two new power plants on the Abitibi River and on the Quinze River will be ready to augment the supply of electrical energy. The Hollinger will absorb the output of the plant on the Abitibi River, and, we are confident, there will be, by that time, a large demand for the Quinze power. To gauge this demand we must take a peep into the future of the area within reach of Quinze River.

First of all, it is well to bear in mind the fact that Sudbury is as close to the Quinze River as is Timmins. It has been decided already to construct a power line from the Quinze to Porcupine; a line could be constructed with equal facility to the great nickel camp. A circle of 110 miles radius, with centre at the Quinze, touches Timmins, strikes through the centre of the nickel camp, and includes by far the larger part of Ontario's metal mines, present and prospective. This circle includes as well the whole of the Quebec gold belt, the western end of which is forty miles from the new power plant.

Within this area, which is now and promises to be for many years to come the most important metal mining district in Canada, the water powers adjacent to developed mines are now virtually all in use. Apart from undeveloped powers on the Ottawa River below Lake Temiskaming and some small powers on the Abitibi River, the Quinze is the only substantial source of supply for the mines of the future. Fortunately the amount of power available in the fifteen falls and rapids that give the river its name is very large, its drainage basin extends eastward for over one hundred miles and includes 9,500 square miles, and there are excellent opportunities for regulating the flow of water by storage dams.

Though the present demand for power at the mines does not reach the total of that under development, it appears as if it would reach that total within a few years, and within a short term of years will much exceed it. Consider the near-mines first. Vipond's future is assured, and it is possible it will develop into a fourth to be added to the "big three" of Porcupine. Goldale and Newray are only one stage removed from being mines, and the substantial sums now appropriated for their further development by the experienced engineers in charge is a sufficient indication of the good chances for success. The work now in progress on various other properties in the Porcupine camp is more than likely to disclose some more workable gold deposits.

The productive area at Kirkland Lake will be extended materially in the near future, unless the judgment of New York and London investors who have taken up properties at substantial prices during the past year is astray. There is no large surplus of power available in the camp, and the Quinze will be its chief recourse for an augmented supply.

Far from declining in interest, the silver areas of which Cobalt is the centre are attracting more attention every day, and the expenditure on exploration thus stimulated will probably result in the establishment of a number of new and important mines. A substantial beginning has been made at the Keeley and the Frontier, and other likely-looking localities in South Lorrain are now being investigated. Veins in a similar geological location in the Gillies Limit to the northwest are being explored seriously for the first time. Further underground prospecting along the lower contact of the diabase sill at the Beaver and Temiskaming mines is being well rewarded. On the Columbus and Ophir claims, just to the south and southwest of these, promising showings in the Keewatin greenstone have never yet been followed down to the underlying diabase; no doubt the present wave

of interest in silver properties will result in this being done. Certain parts of the Gowganda area, in the vicinity of the present producers, have never yet received the attention they deserve; probably they too will now be explored. Should the course of well-directed exploration in these various silver areas be attended with even an average reward, the new mines will augment materially the total requirement for power, which depends ultimately upon the Quinze.

Prospective mines in Quebec's gold belt will be almost entirely dependent upon the Quinze for their power. What their total requirement will be, only time will tell, but there are some mining men and geologists, known to us for their solid conservatism and long vision, who have ventured to predict that, before many years have passed, the gold mines along this hundred miles will require the development of another and still another of the water-powers of the Quinze.

Northeastern Ontario and northwestern Quebec seem destined to become one of the world's great centres of metal production. Already this area is pre-eminent for its nickel and cobalt, and famous for its silver and gold. The Quinze will be the centre of its power supply. It is fortunate that nature has provided in so convenient a locality such a vast potential source of electrical power.

COAL IN THE MARITIME PROVINCES*

By John McLeish**

Less than one per cent of Canada's total coal resources are found in her eastern coal fields in the provinces of Nova Scotia and New Brunswick, all of the rest being west of Winnipeg. Nevertheless the collieries of Cape Breton were among the first worked on the American continent and during 1922 the eastern fields produced 39 per cent of the total Canadian output. Mining operations are known to have been in progress since 1785 and indeed many of the difficulties now encountered in this field are due to the early attempts at mining when the main object was an immediate output of fuel at lowest possible cost and little consideration was given to the future possibilities of undersea mining at long distances from shore shafts.

The coal, which is bituminous in character and of varying quality, is mined in five areas, or fields, usually referred to as the Sydney and Inverness fields in Cape Breton, the Pictou and Cumberland fields in Nova Scotia proper, and the Minto field in New Brunswick. The Sydney field is the most extensive and is credited with about 78 per cent of the total available coal in the two eastern provinces. The Cumberland and Pictou fields possess a little less than 10 and 9 per cent respectively of the total; the Inverness field about 2½ per cent; and the New Brunswick field about 1½ per cent.

In 1913, the two provinces produced a total of 8,050,000 short tons and in 1922 only 5,850,000 tons. The relative amounts produced from the several fields last year were: Sydney field 70 per cent; Cumberland 11.8 per cent; Pictou 9.7 per cent; Inverness 3.4 per cent and Minto 4.9 per cent. The output is used largely for locomotive fuel and for bunkering ships. It is used by industrial power plants in Eastern Canada and for the manufacture of coke to supply the iron and steel furnaces at Sydney. It is also used to a large extent as a domestic fuel throughout the Maritime Provinces. For domestic use the output of particular mines and selected seams is employed, but even at that many consumers in the cities of Halifax and St. John and other points prefer to pay a much higher price for Pennsylvania, or Welsh anthracite. Much of the Nova Scotia coal is high in sulphur and for the manufacture of metallurgical coke a careful selection of the coal is necessary. The coal so used is further washed to reduce its ash and sulphur content. In 1914 over 2,600,000 tons of Nova Scotia coal were marketed in the province of Quebec. During the war this market was almost entirely lost but by 1922 had been regained to the extent of about 50 per cent.

Production during the first six months of 192 showed a decided improvement over the corresponding period of 1922 with an increased production of over a million tons and with largely increased shipments to the Montreal market contracted for.

It is estimated that the strike during July caused a loss in ouput of about 400,000 tons. It also resulted in a loss of some of the sales that had been made in the Montreal market. Within two weeks of the resumption of mining, however, the daily output again reached a high level.

Practically every colliery is working at maximum output consistent with the available labour for work at actual mining. A persistent shortage in the number of miners has been increased through considerable numbers joining the ranks of the harvesters going to Western Canada. Yet despite these drawbacks if there are no further serious interruptions to output the 192 production may exceed that of any of the past six years.

At the present time large expenditures are being made on permanent improvements that will contribute materially to a better and safer production of coal.

With labour conditions on a more satisfactory basis and rates of compensation so adjusted as to attract and retain the native miner, our eastern coal fields will be placed on a better basis to take care of wider markets. The extent to which these wider markets can be obtained in central Canada will depend on ability to compete in quality and price with the enormous producing capacity of United States bituminous mines.

* From "Natural Resources," Ottawa.
** Director, Mines Branch, Ottawa.

CANADIAN ENTERPRISE IN PERU

The field investigations in Peru of Canadian petroleum geologists in the employ of the Imperial Oil Company have resulted, within a decade, in a marvellously productive oil field being found and exploited. A large part of the white community at Talara ano Negritos, the chief of the little desert towns established at the refinery and the oil-fields, is Canadian, and the constant movement to and fro necessitated by the tropical climate of this part of Peru has made a considerable number of Canadians familiar with this part of the southern hemisphere. The Imperial Oil Company maintains its own tanker fleet, and so a notable part of Canada's petroleum supply, though derived from a foreign land, is completely under Canadian direction.

Natural Gas and Petroleum Resources of Western Canada

Helium—Its Occurrence, Recovery and Use

By NEWTON W. EMMENS

The success attending the flight of the United States gid airship ZR-1 from New York to St. Louis and eturn is an epoch-making event in aerial navigation ith heavier than air machines. It is the first time n history that an airship has used the gas helium as s lifting force, instead of the gas hydrogen. For hose unfamiliar with the subject the outstanding im- ortance of the replacement of hydrogen by helium or inflating airships can be better realized when it is nown that helium is non-inflammable, retains its fting power for a greater length of time owing to ts diffusing and consequent waste through fabrics eing only one half that of hydrogen, and yet has 92 per cent. of the buoyancy of this latter gas.. This neans that all danger of explosion or burning of an irship filled with helium is removed, and its cruising adius is increased because the helium retains its lift- ng power for a longer time.

Canadian Helium Reserved to the Crown

The petroleum and natural gas industry is directly nterested in this subject because natural gas is the nly known source of helium in quantities sufficient o make its separation and recovery practicable, and he United States and Canada are the only countries having natural gas sufficiently high in helium to make its extraction on a commercial scale possible, so far as our present knowledge extends.

The governments of the great powers are fully alive to the value of helium for military and naval purposes, as is shown by the vast sums spent upon developing a process for its recovery and in investigating every possible source; and our own country has not only played an important part in these investigations, but reserves to the Crown any and all helium contained in natural gas obtained from any Crown lands under lease, with the right to erect plants for its recovery. A clause to this effect is inserted in the petroleum and natural gas leases issued by the Department of the Interior,—a wise provision, because the cost of the requisite plant is very high and the market for the product extremely limited, being confined entirely to aerial navigation with heavier than air machines. In time of war, however, the possession of a large supply of helium will be a matter of vital importance, and will give the country possessing it an advantage almost impossible to overcome.

Helium in the Sun, and in Uraninite

The element helium was first discovered by J. N. Lockyer in the year 1868 during an eclipse of the sun, when he was making a study of the chromosphere (the layer of incandescent gas surrounding the sun) with the aid of a spectroscope. While Lockyer recognized many of the terrestrial elements in the solar chromosphere, he noted and called attention to a brilliant yellow line in the spectrum which, while apparently associated with the yellow lines of sodium (known as the "D" lines), did not exactly correspond with any of them. Lockyer, Janssen and Frankland carried out further investigations of this bright yellow line, and, finding that it could not be ascribed to any known element, suggested that the name "helium" be given to the element producing it, a name derived from the Greek word meaning sun.

In 1888 W. F. Hillebrand, of the U. S. Geological Survey, in the course of his study of the mineral uraninite, found that when dissolved in acid it gave off a quantity of inert gas, which he concluded was nitrogen. In 1894 Rayleigh and Ramsay discovered in the atmosphere a new inert gaseous element to which they gave the name argon.

Helium in the Atmosphere

In 1895 Ramsay, through Sir Henry Miers, learned of the experiments of Hillebrand in obtaining an inert gas from certain uranium minerals, which was considered to be nitrogen. Thinking that perhaps this gas might contain argon, Ramsay obtained from Hillebrand for experiment a sample of the mineral cleveite (one of the uranium minerals) from which he extracted the gas by boiling the mineral in acid. After removing the oxygen and nitrogen the residual gas was examined spectroscopically with the result that the bright yellow line of helium was at once recognized. Its existence in the earth was announced to the world in a paper published in the "Chemical News" (vol. 71, p. 151, 1895) and in a paper read before the Royal Society, London, by Sir William Ramsay in the same year.

Further investigations by Ramsay disclosed the fact that other uranium-bearing minerals contained helium, as well as some of the rare-earth minerals such as monazite and thorite (thorium, cerium, lanthanum and didymium minerals). A few months after the discovery of helium in the uranium minerals its discovery in the atmosphere was announced by H. Kayser; also its presence in the gas emitted from the mineral springs of Wildbad, in the Black Forest, Germany. Subsequent investigations by a number of scientists has disclosed the fact that helium is widely distributed through the earth's crust, not only in many minerals and rocks but in mine gases and in the gases from many mineral springs and fumaroles.

The latest determination by Sir William Ramsay (1915) of helium in the atmosphere near the earth's surfaces places it at 1 part in 245,300 by volume; but that the proportion increases above the adiabatic layer (5 to 7 miles above the earth's surface) J. H. Jeans has calculated the theoretical proportions of the several gases at different levels in the upper (isothermal layer) atmosphere and concludes that at a height of 50 miles above the earth the heavier gases disappear and that the atmosphere consists of hydrogen, nitrogen and helium, with a small quantity of neon and oxygen, while at a height of 100 miles the atmosphere consists almost entirely of hydrogen and helium with very small proportions of the other gases.

Helium in Natural Gas

In 1907 Dr. H. P. Cady and D. F. McFarland of the University of Kansas carried out investigations into the nature and composition of natural gases from the Kansas fields, paying particular attention to certain gases that were non-inflammable owing to their large nitrogen content. In the course of these investiga-

tions it was found that many samples tested showed appreciable amounts of helium, particularly those having a large nitrogen content, some of which were found to contain as high as 1½ per cent. of the rare gas. The results of these investigations were made the subject of a paper by Cady and McFarland, which was published in the "Journal of the American Chemical Society (vol. 29, 1907, pp. 1523 et seq.); but aside from being of considerable scientific interest, no importance was attached to the discovery.

On February 28th, 1915, Sir William Ramsay wrote to Dr. R. B. Moore, who was at that time Chief Chemist of the Bureau of Mines of the United States, and who had previously worked with Ramsay in investigating the rare gases of the atmosphere, asking him about certain mine gases and stating, among other things: "I have investigated "blowers" — that is, coal-damp rush of gas — for our Government for helium. There does not appear to be anything in the English blowers, but I am getting samples from Canada and the States. The idea is to use helium for airships." Dr. Moore did not make any public comment on these remarks of Ramsay's because the United States was officially maintaining strict neutrality, even if many of her citizens were selling munitions to the allies; but he remembered the discoveries of helium in the Kansas natural gas and realized what it would mean to the nation that had large quantities for use in balloons and dirigibles.

War Stimulated Processes for Recovery

The Board of Invention and Research, London, realized the importance of having supplies of helium for the use of the army and navy for aeronautical purposes and invited Dr. J. C. McLennan, in 1915, to determine the helium content of natural gases within the Empire and to work out some practical method of recovering it on a large scale. In the investigations that followed Dr. McLennan was ably assisted by his colleagues of the University of Toronto and the Canadian Department of Mines. By 1916 a system had been worked out whereby it was possible to produce helium gas having a purity of 87 per cent., but considerable difficulty was being experienced in removing the last traces of the heavier hydrocarbons. Experiments were conducted with various types of rectifying apparatus and by 1917 considerable progress had been made and considerable quantities of helium of different grades had been produced.

During the spring of 1917 the United States decided to come into the war on the part of the Allies, and at a meeting of the American Chemical Society held in Kansas City in April of that year, Dr. Moore brought up the subject of helium for war-balloon use and its separation from natural gas, calling attention at the same time to the richness in that element of certain natural gases in Oklahoma and Texas. The matter was brought to the attention of the United States Bureau of Mines and they placed it in the hands of G. A. Burrell, who at that time was in charge of the Bureau's war-gas work. Mr. Burrell was aware of the rich helium gases of the Petrolia field, Texas, and a number of conferences were held with officials of the various army and navy departments interested, at which the question of helium production was discussed from every angle, and it was decided to go ahead.

Linde, Norton, Claude and Lacey Processes

Dr. Cottrell called Mr. Burrell's attention to th Norton process of extracting helium from natural ga and suggested that this process be tried. Mr. Norto was called to Washington in June 1917 and as a resul of the conference it was decided to erect an exper mental plant. It was further suggested that the Lind Air Products Co., the Air Reduction Co., and th Lacy process people be requested to coöperate with th Government of the United States in this helium undertaking. This suggestion was acted on and a the recommendation of the joint Army and Nav Board an appropriation of $100,000 was made to carr on this helium work under the direction of the Burea of Mines.

In the latter part of 1917 the British Admiralty sen Commander C. D. C. Bridge and Lieut. Commande S. R. Locock to go thoroughly into the helium ques tion in the United States and investigate its possibil ties, as they (the Admiralty) were very anxious t secure 100,000,000 cubic feet of the gas for immediat use and to contract for a further supply of 1,000,00 cubic feet a week. The arrival of this British com mission in the United States stimulated the interest o the U. S. army and navy authorities in helium an resulted in further appropriations being made so tha experimental plants could be built to try out the processes of the Linde, Claude and Lacy companies in addition to the Norton process already decided upon Of these experimental plants three were built, two a Fort Worth, Texas, one using the Linde and the other the Claude system; and the third at Petrolia, Texas, using the Norton process. All three plants produced helium and at the time the armistice was signed there were lying on the docks about 150,000 cubic feet of the gas, compressed into cylinders under a pressure of 2,000 pounds per square inch, awaiting shipment to France.

To be continued

PETROLEUM PARAGRAPHS

In east central Alberta the No. 2 well of the British Petroleums Limited, in the Wainwright field has drilled through 17 feet of oil-bearing sand at a depth of 2,019 feet. Casing has been set and a test will be made of the well shortly to ascertain the production. Considerable gas has been met with in drilling this hole.

The Imperial Oil Company's Grattan No. 2 well in the Irma-Wainwright field is having trouble with casing at a depth of 1,864 feet. Endeavours are being made to remove this casing so that the hole can be deepened.

R. T. Elworthy and R. J. Alford of the Chemical Department of the Mines Branch, Ottawa, have been investigating the natural gas in southern and east central Alberta with special reference to its utilization for the extraction of gasoline and in the manufacture of carbon-black under the recent regulations.

SEMI-DIESEL AIRPLANE ENGINE

A recent incident indicates the direction in which the problem of gasoline motor fuel is likely to be solved. The British Air Ministry has recently completed successful bench tests on a 750 h.p. semi-Diesel airplane engine, which soon will be tried out in the air. A similar engine of 1,000 h.p. is under construction.

REDUCTION IN GASOLINE PRICES IN GREAT BRITAIN

Gasoline prices, which underwent a reduction of ıbout 6 cents per gallon in July, were further reduced)n September 25 by 2 pence per imperial gallon,equivaent to 3¾ cents in American money per American galon. The latest reduction means that gasoline is now sold in Great Britain about 1 cent per gallon less than just before the war. At the termination of the war, :oward the end of 1918, the wholesale price of petrol n Great Britain was 3s. 4d. per gallon, but in December of that year the first reduction was made. The new retail prices are therefore less than one-half those ruling when hostilities ceased and show the extent to which the excessive stocks in the United States are affecting prices in this country. It is probable that the present reduction will seriously jeopardize the operations of some of the small companies in the petrol trade. —**Commerce Reports.**

PETROLEUM IN TASMANIA

A report by A. McIntosh Reid, Government Geologist of Tasmania, on the search for oil in that island contains the following summary statement: "The recent discoveries in the Mersey Valley district are very important, not only because of the prospects there, but because they lend encouragement to operators in other fields. Natural oil in commercial quantities has not yet been found, but seepages occur, and the geological conditions are particularly favourable."

OIL AND GAS IN FRANCE

The French financial weekly, **Radio-Midi**, states that there has been much activity in prospecting for oil in various parts of France in the last few months. The Ministry of Public Works organized a committee of scientists to study petroleum in France, and this committee formed a special branch to conduct geological researches. As regards the region included in the Bordeaux district, it is learned that a mission comprising three scientists has begun a survey in the Departments of Hautes-Pyrenees, Basses-Pyrenees, Landes, and Gers. The survey is expected to be completed in two months. The same publication on September 8 mentions that at Castagnede, Department of the Basses-Pyrenees, in one of the borings which exceeded a depth of 100 meters the discharge of gas is so considerable that the drilling is only proceeding at the rate of a few centimeters a day, instead of several meters as was the case when drilling through the bed of sand.—**Commerce Reports.**

TITANIA GLASS

At a meeting in Sheffield on October 17th of the Society of Glass Technology, a paper was presented by A. R. Sheen and W.E.S. Turner entitled. "The effect of Titania on the Properties of Glass." The paper first discussed the present interest in heat resisting glass, and pointed out that modern heat resisting glasses contained a high percentage of silica, and also boric oxide in considerable amount—**e.g.**, the well-known glass, Pyrex (which owed its high thermal endurance to its exceptionally low co-efficient of expansion, 0.0000032) contained approximately 80 per cent, silica and 12 per cent. boric oxide. There were, however, objections to the use of these oxides. In the case of silica the difficulty was merely one of obtaining a sufficiently high melting temperature. On the other hand, glasses containing boric oxide were very readily melted, but here the objection was the effect of the oxide on the durability of the glass. Recent research in the Department of Glass Technology of Sheffield University had shown that as the B_2O_3 content of a glass was increased the durability towards water and acid increased to a maximum, and then as the B_2O_3 content was further increased the durability fell off rapidly. Boric oxide containing glasses (and, of course, glasses with high silica content), on account of their acidic nature, were very readily attacked by alkali—**e.g.**, it was quite useless using Pyrex ware as an alkali container. What information there was concerning the use of titania in the production of glass seemed to point to the fact that titania glasses were heat reisting, but no experimental data were given. It was with this consideration specially in mind that this piece of work was undertaken.

At the outset preliminary tests were made to find out what mixture of silica titania and soda would give glasses at the highest temperature obtained in glass melting practice—**e.g.**, temperature of 1,400° to 1,450° C. There were indications during these melting operations that titania glasses were heat resisting. It was found in many cases that the glass could be removed straight from the furnace and allowed to cool down in the open air without splintering or cracking of the mass of glass occurring.

After considering the analyses of these six glasses, the first question dealt with was the durability of the titania glasses towards water. It was found on comparing with the corresponding lime and magnesia glasses, that the titania glasses were less attacked than the lime glasses, especially in the earlier members of the series. The durabilities of the titania glasses were found to be practically the same as those of the correspondent magnesia glasses.

The annealing temperatures were found to be rather less than those of the corresponding lime and magnesia glasses.

Next, the important question of thermal expansion was dealt with. The thermal expansions of these titania glasses (only the first four glasses of the series were tested) were only slightly less than those of the corresponding lime glasses. Therefore if titania glasses are heat resisting it is certainly not due to their having a low expansion, as is the case with Pyrex glass, for example, but the cause must be sought in some factor, such as tensile strength or elasticity. These glasses possessed good working properties, their viscosity increasing as titania replaced soda. Throughout all the glasses melted in connection with this work there was hardly any evidence of devitrification occurring. This bore out the statement of previous workers that titania hindered devitrification.—The Chemical Age.

LABOUR COST ON THE RAND

Treatment costs per short ton on the Rand were reduced from 25s 8d in 1921 to 23s 6d in 1922, due principally to the reduction of wages to white miners and a reduction in the number employed. White miners received 33s 9d per shift in 1921, and 23s 4d per shift in 1922, while native labour cost 3s 5d per shift. Another important factor in the reduction of working costs is the improved drilling efficiency due to the use of hammer drills, whose capacity is 6 or 7 holes per day against 4 for the reciprocating drill.

NEWS AND COMMENTS

By ALEXANDER GRAY

Eustis Making Copper Concentrate

Notwithstanding high freights and low metal prices the Eustis company of the Quebec Eastern Townships, is operating on a small scale, mining about 200 tons a day, making a 22 per cent. copper concentrate by differential flotation, and a tailing that should be sought by chemical companies for its sulphur content.

Coniagas and Newray

It is a doubtful compliment the daily press has been paying to the Coniagas company for "gambling" a million, if necessary, to make a mine of the Newray. Thus far, the expenditure does not exceed $125,000, and it may not be necessary to expend more than $500,000 before the mine will be ready for a mill. Somewhere, according to the daily press, between $125,000 and the million, "the Coniagas will have a big and profitable gold producer in the Newray."

Now, if there is one mining corporation in the Northland that has earned a reputation for conservatism in its quest for reproductive opportunities, it is the Coniagas. Reaching for chances to share their profits with the country that brought them wealth, Coniagas' chief owners may have "gambled", but that is hardly the word by which to designate constructive enterprise, however speculative.

Playing with surplus money with a purpose always has been a part of Coniagas policy. It went to Bruce Mines, had a try here and there, abandoned a Porcupine undertaking, has participated in South Coleman, entertained Larder Lake, gave consideration to Quebec—and now there is in Newray workings "considerable low-grade ore, with occasional patches of high-grade" — the latter being descriptively inept.

The very fact that the Coniagas is going ahead with development and permanent equipment, is an assurance that Newray is presenting sufficient inducements; therefore it has ceased to be a "gamble". Moreover, the company's representative in the Newray operation has known a good deal from the beginning about the underground conditions, for he directed a great deal of the development under other ownership and urged the provision of milling equipment. Consequently the structural features must have appealed to him, or Coniagas owners would not have taken the risk.

Gambling with their Own

More to the point, with reference to the Coniagas gambol — if the Newray development has an adventurous and playful aspect — is the importance of the extension of the Pearl Lake ore-bearing horizons. A year or two ago a shear zone was said to exist on the Holtyrex. Drilling had indicated something worthy of exploitation in the Newton. Duplications of porphyry intrusions, if not triplications, were intimated. Now it is stated that "there is a tongue of porphyry about 800 feet in length along the southern part of the central section of the Newray."

To prove the economic worth of that, is something of which Coniagas capital and technical staff is capable, and the outcome will be awaited with eagerness. Another mining area where it was not thought possible when the Rea was forsaken, and still another a result of the Vipond development below the basal may make scientific "gambling" the best sort o gamboling for those who can afford it.

Canadel—Oh Canadel!

Unauthenticated reports that the McIntyre Company is taking over the Platt Veteran Claim, and that the Lewisohn management of the Goldale is meeting with substantial encouragement at the 1,000-foot level recalls to mind that little has been heard of Canadel efforts to make a mine out of the Rochester Veteran Claim. The Lewisohn interest has the goodwill of all identified with the Porcupine camp. It has been thorough and has done more than it contracted to do. Should the Platt Veteran ground fall into the McIntyre lap, that may be one reason why President Bickell went to London, to place the shares that were optioned to New York people, and that have not been marketed. Possibly the Goldale development and that at the Vipond may have prompted the McIntyre to move on the Platt. At any rate, there will be nothing around Pearl Lake that will be unacquired by producing companies or those in a position to operate, should the Lewisohn management take over the Schumacher mill

This leaves the Rochester Veteran to serve its probationary period and be extricated from stock flotation methods deserving of severest censure. Not only was the Canadel a hodge-podge affair but it is well understood the property has not been paid for. The London prospectus represented that the Rochester title is vested in the Canadel combination. How the promoters got away with this is unexplained. As a matter of fact the purchase price is $175,000. Of this amount $75,000, or thereabout, has been paid. Other payments are due in the near future. Meanwhile work is proceeding at the property. If those who represented — or misrepresented — the actual owners, do not succeed in meeting the further installments, it is not unlikely there will be a warm half-hour or two in London.

Nothing ordinarily attempted by sleight-of-hand artists could excel the tactics of expert promoters. If London officials and subscribers countenance such things, crude manipulators who frame up "easy money" ventures without regard to the outcome, need not be punished — unless they are too rough about it.

PLATINUM IN THE TRANSVAAL

A platinum-bearing lode one hundred miles north of Pretoria, South Africa, has been traced for a distance of twenty miles, stated Mr. Max Baumann in a paper read in September before the Chemical, Metallurgical and Mining Society in Johannesburg. The average value so far disclosed is low, but a search is being made along the lode for ore of workable value. As is well known, platinum in small quantities occurs with gold in the banket of the Rand.

The United States now produces over 90 per cent. of the dyes consumed in the country; in 1914 imported dyes were 90 per cent. of the total used.

ELBOW LAKE GOLD AREA

Summary Report, 1922. *Part C*, of the Geological urvey contains a report by P. Armstrong, from which he following is abstracted:

The widespread interest aroused by the gold occurences in the Elbow Lake area, northern Manitoba, nade a detailed survey of its geology and mineral eposits desirable. This was carried out by the writer etween June 10 and September 10, 1922, and the reults are given below.

The area examined is shown in the extreme northast corner of the Geological Survey map of Athapauskow Lake area (No. 1726). It lies between 54°30′ nd 54°45′ latitude and is bounded on the west by 01° longitude. Its total areal extent is about 165 quare miles and comprises Elbow lake proper, with Webb and Hassett lakes lying to the northwest and ortheast respectively, and Claw lake to the southeast.

The camp first to public notice after the discovery y G. C. and K. C. Murray, early in 1921, of extremely ich gold ore on what is now known as the Murray roup, situated on the east shore of Elbow lake at point where Grass river leaves the lake.

In October, 1921. interest identified with the Hollinger Consolidated Gold Mines, Ltd., of Timmins, ook an option on this group and some adjoining laims. Their entry into the area was followed by hat of the Exploration Company, Ltd., of London, England, who optioned various claims in the northern art of the region. Meanwhile much and promisuous staking had taken place, so that at the time of he writer's visit almost no ground, mineralized or arren, within the area, was open for location. Unfortunately for the camp and the mining industry in general, most of the staking was done by relatively few men, acting under power of attorney for outside speculators. Hence it devolved on the two companies mentioned and a few experienced and energetic prospectors to prove the camp.

On June 10, 1922, the Hollinger interests suspended operations and have since allowed their option on the property to lapse. The Exploration Company also withdrew from the district definitely towards the end of August. At the end of the writer's sojourn in this ara only one or two prospectors were continuing to developtheir claims, but according to latest reports a new company, the Gordon Murray Gold Mines, Ltd. is operating the Murray group and some adjoining claims with a small force of men.

Economic Geology

This area offers no example of a true fissure vein, i.e. of a fissure of sustained length, depth, strike, and dip due to faulting or shearing of the country rock with simultaneous displacement, laterally, of the walls and filling of the spaces thus created. The closest approach of any of the deposits to this type of rock opening is found in the Murray group of claims. These deposits occur in a quarzitic gneiss which during the regional folding was sheared along closely spaced planes, 6 inches in width and generally of limited extent in their other dimensions. Numerous tension cracks, irregular in dip and frequently intersecting each other, also occur, sometimes widening out, where fracturing has been most intense, into larger openings now filled with vein matter. These fractures are too irregularly disposed, and too widely spaced, to be considered a sheeted zone. The Murray deposit is the only one found in this area located within a sedimentary bed, and is also the only representative of the type just described.

A second type is illustrated by the so-called "Garbutt vein," really a quartz porphyry dyke, of post-Amisk age, that cuts across the folded greenstones. During the ore-forming period this dyke was sheared, producing short, narrow, somewhat disconnected fissures or irregular shatter zones in which the vein material was deposited. The direction and intensity of movement are indicated by a border of finely laminated schist, 4 to 5 inches wide, on either side of the dyke and running parallel to it.

The third, and by far the commonest, type of rock opening is exemplified by the Sherlock claim, and shows the close time connection that must have existed between the folding process and that of ore deposition.

The Ore Deposits

Although only on one property, the Murray group, is the ore deposit situated in contact with the granite, no difficulty exists in ascribing the origin of the Elbow Lake ore deposits to the influence of the granite batholith. The position of the greenstone area, deep within, and entirely surrounded by, the granite; the absence of any other deep-seated igneous body, not directly connected with the granite, within the region; the high temperature character of the minerals such as tourmaline, zircon, pyrrhotite, arsenopyrite, are all evidence of this origin.

The deposits on the claims of the Murray group occur in a sedimentary gneiss which prior to the metamorphism of the region was a coarse, slightly feldspathic sandstone. Between this gneiss and the granite batholith which occurs close by is a broad belt of what was locally called a quartz porphyry, but under the microscope proved to be a quartz diorite and is considered to be a border phase of the granite and not a separate intrusive. During the folding attendant on the intrusion of the granite batholith, tension fractures developed in this gneiss. Some of these factures, subsequently, were filled by quartz containing pyrite and gold; others by an asemblage of pyrrhotite with tourmaline, orthoclase, and quartz. Individual veinlets yielded ore of extraordinary richness, but the fractures were small and far apart, and the pyrite with which the country rock is impregnated carries no gold values that might make profitable the mining of veinlets and country rock together.

PERSONAL AND GENERAL

Mr. R. M. Wolvin has spent a good deal of time recently in Sydney, attending personally to executive business in the head office of the British Empire Steel Corporation.

Dr. F. J. Alcock of the Geological Survey, Ottawa, lectured on Nov. 9th., before the Mining and Metallurgy Society of Queen's University, on the geology and physiography of Gaspé, and the zinc deposits at the Federal Zinc and Lead Mine.

Mr. Edward Godfrey, of Canadian Explosives, Ltd., has spent some time round the collieries of Cape Breton during the past few weeks, and conducted some very interesting and instructive tests with mining exposives.

Dr. E. P. Mathewson, of New York, has been elected a Representative Fellow of McGill University, his alma mater, by the graduates.

The Flinflon Copper-Zinc-Gold Ore

Description of the 16,000,000-ton Deposits in Northern Manitoba

By F. J. ALCOCK

The Department of Mines, Ottawa, has now published *Summary Report*, 1922, *Part C.*, which contains a 36-page report by Dr. F. J. Alcock on the Flinflon map-area, from which the following paragraphs are abstracted. The report is accompanied by a contoured map on a scale of 250 feet to the inch of the claims on which the Flin-Flon ore-body occurs, four horizontal sections at depths up to 735 feet, as determined by diamond drilling, and five vertical cross-sections. The regional map is not yet ready, and will be distributed later . The abstract follows:

Since 1913 the mineral belt north of The Pas, Manitoba, has attracted considerable attention. It has produced one important mine, the Mandy, from which over $2,000,000 worth of copper was recovered. Another ore-body, Flinflon, has been shown by diamond-drilling and underground development to contain over 16,000,000 tons of iron-copper-zinc sulphides carrying, in addition to the copper content, values in both gold and silver. Other sulphide showings in the region have also been staked. In addition to these sulphide bodies many claims have been taken up for gold. The more important of the gold-bearing veins yet located lie at the eastern end of the mineral belt in the vicinity of Wekusko lake. In 1914, the Geological Survey commenced mapping this whole region and by 1920 two sheets had been issued, covering the entire mineral belt. The first or western is on a scale of 3 miles to 1 inch, under the title of the Athapapuskow Lake region and the second, on a scale of 2 miles to 1 inch, is known as the Reed and Wekusko Lakes sheet. Recently need has arisen for more detailed geological information regarding the area, and the writer, consequently, was instructed to map an area of about 50 square miles surrounding the Flinflon and Mandy properties.

The area lies along the boundary line between Saskatchewan and Manitoba with approximately half in either province. It has a length in a north and south direction of 8 miles and a width in an east and west direction of 6 1-2 miles. The nearest point on the railway is the town of The Pas, Manitoba.

In 1913, the finding of gold-bearing quartz veins on Amisk lake caused a great deal of activity in that region. In the following year Woosey and Hackett found good quartz showings on the Kiski-Wekusko property at Wekusko lake, and active prospecting commenced in that part of the mineral belt. In the summer of 1915 the Flinflon ore-body on Flinflon lake was staked, and in the autumn of the same year the Mandy lens was located by Reynolds and Jackson. The latter property was taken over almost immediately by the Tonapah Mining Company, whose engineer, Mr. J. E. Spurr, was in the region at the time, and work was begun without delay. Active prospecting has been continued up to the present time and a great many claims have been taken up, both on quartz veins and on sulphide showings.

Geological History

The first event of which there is a record in the history of the region was a long period of great volcanic activity. Lava poured forth from fissures and craters covering wide areas of country. Volcanoes of the explosive type were abundant, and the ash and the coarser fragments from these gave rise to the beds of tuffs and coarse pyroclastic material that form common rock types in the area today. Acid and basic dykes derived from the same source as the flow rocks were intruded into the volcanic complex. adjacent regions sediments were locally being accumulated during the period of volcanism. These are now sedimentary gneisses and schists. In some places they are found underlying the volcanics; in others they overlie them; and in still other parts of the region they are interbedded with the volcanic rocks. These metamorphosed sediments have been named the Kisseynew gneisses in the Amisk Lake region, the Wekusko series in the Reed-Wekusko Lakes region, and similar rocks occur in several other areas of Manitoba. What the basement was, upon which these volcanic and sedimentary rocks were deposited is not known. Wherever their present base is found there is a younger granite which has come up from below and intruded itself into them. The finding of granite boulders in the very oldest sediments, however, points to the conclusion that the ancient terrain was, partly at least, granitic.

Deformation and intrusion followed this period of volcanism and sedimentation. The country was uplifted and a new cycle of erosion was inaugurated. The deposition of two series of sediments followed, a lower consisting dominantly of shale, and an upper one of arkose and conglomerate. Earth movements and an erosion interval separated the deposition of these two sedimentary series, called respectively the Lower and Upper Missi.

Granite Intruisions Bring Minerals

This period of sedimentation was terminated by folding and intrusion. The early intrusions were basic, and are represented by dykes of lamprophyre and gabbro cutting the Missian and older rocks. Then came the great batholithic invasions of granite, during which the country was uplifted and folded, and a mountainous topography was produced. In the late stages of the cooling of the granitic magma, solutions carrying iron, copper, and zinc sulphides were given off and, locally, replaced the older rocks, forming such ore lenses as the Mandy and Flinflon. In other places solutions carrying silica travelled along fracture planes and gave rise to the gold-bearing quartz veins. This period of intrusion extended over a long time. The earlier and later intrusives were basic. The batholithic masses were granitic, but all the intrusives were, probably, related.

Following this period of folding and intrusion came a long period of erosion. Little by little, through the action of rain, frost, and other destructive agents, the mountainous topography was worn down and the eroded material was carried away by streams. Steep-sided valleys gradually assumed more gentle slopes, and after a long period of time a flat-lying country of low relief rising gently back from the sea took the place of the former mountains. In this long period of erosion so much of the surface rocks of the region was removed that the granites, which had originally cooled at great depths, became exposed over wide areas of country. Only a few scattered remnants — commonly synclinal masses between granite batholiths — survived, to serve as the prospecting fields of the present day. The Flinflon area is part of one of the larger districts where these older rocks have survived.

Post-Cambrian Geology

Over this region of Precambrian rocks there swept, in the Palæozoic era, successive invasions of the sea. The chief of these took place in the Ordovician, when much of

ie interior of North America was flooded. In this sea ere deposited the limestones of Lake Athapapuskow re- ion. Other invasions took place in the Silurian and De- onian. In the Mesozoic era, sediments were deposited the southwest of the Flinflon area in the Pasquia hills nd they may even have extended over the map-area itself, ut if so they been entirely eroded.

In the Tertiary period the region was once more above ie sea, and undergoing erosion. Much of the covering of 'alæozoic rock was removed. At that time the country resented a great contrast to what it is like at present. lthough it had the same low relief, the streams were mooth-flowing, with no rapids or falls. There were no akes, and, in place of the bare rock-ridges such as are een today, there was probably a mantle of residual soil.

The last important event in the geological history of the egion, which gave the country its present character, was he advance of great sheets of ice from the northeast. 'hese removed the residual soil, smoothed down the topo- raphy, polished and striated the rocks, and, by dropping he débris irregularly over the region, dammed up river alleys and completely disorganized the drainage system. Numerous lakes were formed throughout the region.

During the latter part of the Glacial period, while the ce was disappearing, a great lake formed in front of the etreating ice-sheet. Clays accumulated in it and later ecame the great fertile clay belt of Manitoba. This old ake has been called Lake Agassiz; Flinflon area lies just o the north of its old shore-line.

Economic Geology

The ore deposits of the region are of three types: (1) opper-zinc-iron sulphide bodies; (2) gold-bearing quartz eins; (3) iron sulphide bodies. Only the first type has et proved to be of economic importance in Flinflon map- rea. The second type is important farther east at the Wekusko Lake end of the mineral belt. The deposits of ron sulphides are of no commercial value.

The map-area contains two important examples of cop- per-zinc-iron sulphide bodies. These are the Mandy and he Flinflon ore-bodies. The former of these was worked ntil the high-grade ore was removed. The Flinflon ore- body has been blocked out by diamond drilling and under- ground work so that its size and character are known, but no ore has been smelted.

Mandy Mine

Mandy mine is situated on a small peninsula on the west side of the Northwest arm of Schist Lake. Imme- diately after its discovery in 1915, J. E. Spurr acquired it for the Tonapah Mining Company. In the spring of 1916 a drill was installed, the first to be used in northern Manitoba, and by midsummer the entire ore-body had been blocked out and the values ascertained. It was found that there were 25,000 tons of massive chalcopyrite aver- aging about 20 per cent copper, with additional gold and silver values to the amount of $5 a ton, and about 180,000 tons of lower grade ore consisting of mixed copper, iron, and zinc sulphides running from 5 per cent to 8 per cent copper, 20 to 30 per cent zinc, and gold and silver to the value of $5 to a ton.

The ore-body was too small for a smelter to be erected on the property. Owing, however, to the war price of 26 cents a pound for copper, it was decided to commence min- ing operations immediately. The main difficulty was that of transportation. Mining machinery had to be taken in and the ore bed to be sent to Trail, B. C. to be smelted.

The ore was transported by trains across 80 miles of winter road, and then by barges to The Pas. Altogether 25,000 tons of high grade ore was thus handled. The amount and value of copper produced were as follows:

Year	Lbs.	Value.
1917	1,116,000	$ 303,329
1918	2,339,751	576,234
1919	3,348,000	625,775
1920	3,062,577	534,604
Total	9,866,328	$ 2,039,943

In addition to the copper the ore averaged $5 a ton in gold and silver.

The rocks on the peninsula on which the Mandy ore- body occurs are greenstone, pyroclastics, and chlorite schists. The ore lens is in a band of schist with massive greenstone on either side.

The lens is 225 feet long and has a maximum width of 40 feet.

Flinflon Ore-Body

The Flinflon ore-body is situated on the north shore of the southeastern bay of Flinflon lake, about 3½ miles northwest of the Mandy. It was located in he summer of 1915. Diamond-drilling was commenced in March, 1916, by New York and Boston interests and was continued by Toronto interests until 1918. In 1920 New York and Canadian interests conducted underground work from two shafts, which confirmed the diamond-drill results. In May, 1921, the Mining Corporation of Canada bought a majority interest in the property.

General Character

The ore-body lies in greenstone. To the northeast of the deposit the greenstone is massive and amygdaloidal, showing its flow origin. The ore-body strikes north 30 degrees west. Some banded tuffs associated with flow rocks on the summit of Flinflon hill east of the wagon road strike north 12 degrees west. The deposit dips from 60 to 70 degrees to the northeast and the boring records show that it pitches at a low angle to the south. Dykes of quartz porphyry were encountered by the drill; one of these dykes forms the hangingwall of the ore-body for some distance. The ore-body is a fairly regularly-shaped lens, tapering gradually to the northeast and ending rather bluntly to the southwest. As shown in the plans and cross-sections, it breaks up at the southwest end into two parts with minor mineralized zones. The total length of the ore- body on the surface is 2,593 feet; at a depth of 900 feet it has a length of over 1,000 feet. It has a greatest width of 400 feet, but this includes some bands of unmineralized greenstone which occur in the ore-body. The largest of these masses forms the prominent ridge along the strike of the ore-body between the two shafts. At a depth of 900 feet the ore-body has narrowed to 35 feet. It has been calculated that there are over 16,000,000 tons of ore with- out including the unmineralized horses of country rock or the ore below the 900-foot level.

Minerals of the Deposit

The principal minerals in the ore-body are pyrite, sphalerite, and chalcopyrite. Assays show that gold and silver are present. Arsenopyrite, galena, and magnetite have been recorded, and small amounts of native cop- per have been found in the upper part of the deposit. Quartz is present in places between grains of pyrite, and as local veinlets traversing the sulphides. Calcite is rare, but occurs in places with the quartz.

The ore consists of two fairly distinct types, known re- spectively as the solid sulphide variety and the dissemi- nated ore. The solid sulphide variety consists chiefly of very fine-grained, pale-coloured pyrite, containing spha- lerite, chalcopyrite with some rare fragments of schist, and some quartz and calcite. In places there is a distinct-

ly banded effect where the sphalerite and chalcopyrite form narrow bands in the pyrite. The sphalerite is dark in colour, and on the weathered surface assumes a bluish tarnish, probably due to the devolpment of a film of covellite. The disseminated ore consists of country rock, chiefly chlorite schist, impregnated with sulphides. The solid sulphide variety forms the central part of the lens, though in places it extends to the hangingwall, whereas the disseminated ore is largely confined to a zone along the footwall. Disseminated ore is also found on the hangingwall in the upper part of the deposit, but the copper content is here less than in the disseminated ore on the footwall. In places, as shown in both plane and section, disseminated ore forms a zone on either side of the central solid sulphide type. Boundaries between the disseminated and solid sulphide types are, as a rule, fairly distinct, though in places a gradation between the two varieties is found. Contacts between the solid sulphides and the horses of unmineralized rocks are also, as a rule, quite sharp. In places the disseminated variety of ore runs as high as 3 to 5 per cent copper, though the ore-body as a whole averages only approximately 1.9 per cent copper. The sphalerite is more abundant on the hangingwall side than elsewhere in the deposit. The average zinc content for the whole ore-body is about 3.8 per cent. The gold and silver values are, respectively, 0.074 and 1.04 ounces per ton. Galena is rare in the ore-body, but it has been found lining vugs in the country rock.

Origin

The deposit was, clearly, formed by replacement. The presence of unsupported masses of rock in the ore-body, some of them schistose with the plane of the schistosity parallel to that of the wall-rock, and the character of the disseminated ore, consisting, as it does, of country rock partly replaced by sulphides, can be explained only by this method of formation. It is clear also that replacement was along a shear zone.

The source of the solutions that caused the replacement is an interesting problem. There are two possible sources: (1) the basic igneous intrusives of post-Misian age; and (2) the granite of the region. It has usually been considered that the mineralizing solutions came from the granite. The chief argument in favour of this conclusion is the presence of quartz in the ore-body, showing that the solutions that caused replacement must have been silicious and hence more likely to have come from a granitic magma than from a basic one.

Aside from these occurrences of silica, the presence of gold and silver in the ore is suggestive of an origin from the granite. The gold-bearing veins of the region are clearly attributable to the closing phases of the intrusion of the granite batholiths, and it is probable that the sulphides were derived from the same source.

The solutions which brought the ore were hot. The wall-rock near the sulphide zone contains much sericite. Some of the more badly altered rock, near the ore-body, consists only of sericite, quartz, and pyrite. Irregular masses of talc, also, have been found in the chlorite schist and in the sericite schist of the footwall. It is to be concluded, therefore, that the deposition of the ore was the result of the replacement of a sheared zone in volcanic rocks by solutions from intermediate to high temperatures given off from the granite intrusives. The shearing took place during the period of folding that accompanied the granite intrusion, and the replacement occurred towards the close of the period of intrusion. The solid sulphide ore was formed first. Towards the close of the period of mineralization the solutions were relatively richer in copper and gave rise to the disseminated ore on either side of the solid sulphide mass.

Conditions Affecting Mining

To mine the deposit profitably it will be necessary t have a railway to the property, a smelter, and electrica power. There are also other requirements to be met, suc as securing sufficient flux material and determining th proper metallurgical processes to be employed for th solid sulphide type of ore. It is hoped that more or bodies will be discovered in the region to help bear th cost of a railway, smelter, and power-plant.

SAFE ELECTRICAL EQUIPMENT

The following pertinent questions regarding ele trical installations in mine are included in Serial N 2541 of the United States Bureau of Mines, which addressed to the safety engineer:

1. Is there some one in charge of electrical equi ment who is fitted for this position by ability, training and experience?

2. Is a systematic recorded inspection of electric equipment made at least once each month?

3. Is a plan map of the mine kept showing all pe manently installed electrical machinery and apparatu including cables, conductors, lights, etc?

4. Are there instructions for resuscitation from ele tric shock posted in each surface and undergroun electrical station, also at the entrance of the mine an in the first-aid station and are employees working o electrical equipment trained to apply these instruction in case of accident?

5. Are prohibitory notices posted wherever elec trical apparatus that should not be operated by un authorized persons is installed, and caution notice posted where such warning will be most effective i reducing the likelihood of electrical contact?

6. Are persons allowed to work on or with ele trical equipment of any kind before they have bee properly instructed in their duties?

7. Are the metallic frames, casings, and covering of stationary apparatus such as switch-boards, motor and transformers grounded, so as to prevent a shock hazard in case these parts become charged with an electrical current?

8. Are the metallic armors or coverings of cable and wires grounded, so as to prevent a shock hazard i case these coverings become charged from the circui which they carry?

9. Are the metallic sheaths and armors of electri cables electrically continuous throughout their length so that there can be no voltage difference between dif ferent sections?

10. Are power lighting, telephone, signal, shot firing, and trolley circuits properly installed?

11. Are trolley, power and lighting circuits properly guarded?

12. Are your switches, rheostats, fuses and circuit breakers well maintained and inspected?

Then there follow suggestions for the inspection o electric locomotives, hoists, drills, motors, portable lamps and other equipment.

MAP OF KEELEY-FRONTIER AREA

The Ontario Department of Mines has now available for distribution to those interested Map 31A—15, which shows the present productive part of the South Lorrain area on a scale of 400 feet to the inch. It will accompany C. W. Knight's report on the Cobalt silver area.

COAL OUTPUT FOR AUGUST

The Dominion Bureau of Statistics reports that the utput of coal from Canadian mines during August mounted to 1,5855,000 short tons, an increase of 60 er cent. over the tonnage for the previous month, nd 27 per cent. over the average for the month of he three preceding years. The output for the month howed increases of 489,000 tons in Nova Scotia, 98,000 ons in Alberta, 3,000 tons in British Columbia and ,000 tons in Saskatchewan. The cumulative output rom all mines for the eight months of 1923 amounted o 11,376,000 tons, an increase of 22 per cent. over he preceding three-year average for the same period.

Comparison of August and July figures covering he total importation of coal from the United States nd Great Britain showed an increase of 13 per cent. August imports amounted to 2,746,000 tons while in uly 2,445,000 tons was brought in. The August im-ortations this year were 65 per cent. greater than the hree-year average for the month. During the month 6,900 tons was imported from Great Britain. Total mportation of all coal for the eight months of 1923 vas 15,393,600 tons an increase of 55 per cent. over he preceding three-year average for the same period.

The total number of men employed in the coal mines f Canada during August was 28,670 of whom 21,516 vorked underground and 7,154 on surface as compared vith a total of 27,304 in July, of whom 20,202 worked nderground and 7,102 on surface. The monthly pro-luction per man was 55 tons for August as against 36 ons per man for July. During August the production er man-day was 2.34 tons. The "tonnage lost", mounting to 23 per cent. of the possible tonnage was lue in the east to absence of workmen and in the west o lack of orders.

REPORT ON MINING ACCIDENTS IN ONTARIO

Part 10 of the 31st report (1922) of the Ontario De-artment of Mines is now published. The fatal acci-lents during the previous year are recorded as 24, he same number as the previous year, and with the xception of one year (1915), the lowest since 1908. The rate per thousand was 2.54, which is somewhat elow the average rate. As the hazard in gravel pits nd quarries is unusually great, a special inspector was appointed in charge of them with a view to im-roving this record.

The volume includes also a brief description of the mines and prospects visited during the year by the corps of inspectors, giving the resident staff and the financial directorate of each. In the case of the more important mines operating data are included. A short report on the Instruction Classes for Pros-pectors conducted by Dr. W. L. Goodwin is given, describing the resumption of these classes by the Department of Mines after an interval of fifteen years. Some brief notes by the late Joseph Keele on clays on the Missinaibi River conclude the volume.

MINE VENTILATION

A study of the relative value of canvas and gal-vanized iron pipe for metal mine ventilation by fans conducted last winter by the United States Bureau of Mines in the mines of the Anaconda Copper Co., is described in Serial No. 2540. Friction and leakage losses are less with canvas pipe, which is, on the whole, more satisfactory than metal pipe, though it does not last so long.

PURIFICATION OF ALUMINUM SULPHATE SOLUTIONS

The success of experimental work on the purification of copper sulphate solutions and zinc sulphate solutions, made at the Pacific experiment station of the United States Bureau of Mines, suggested that possibly aluminum sulphate solutions could be purified of iron compounds and thus provide a much needed cheap process of producing iron-free alum and other aluminum salts which are now twice as costly as the less pure salts and yet are used in large tonnages by the baking-powder makers and the paper mills, and for water purification. At present, deposits of clay low in iron are the only ones that can be used for chemical purposes. Three different modifications of a laboratory method for hydrolytical removal of iron from aluminum sulphate solutions were worked out. Further experimentation is being conducted with a view to developing this method into a practical process for preparing pure alumina direct from clays for use in the aluminum industry.

B.C. TOPOGRAPHIC MAPS

The Geological Survey, Ottawa, has published two contoured topographic maps of British Columbia areas on a scale of a mile to the inch. No. 1996 covers an area of about 150 square miles astride the North Thompson river 60 miles north of Railways. No. 1897 shows the banks of the Coquihalla river for 40 miles northeast of Hope. Both have a 100-feet vertical contour interval.

WORLD MINERAL STATISTICS

The publication of world mineral statistics covering the period 1919-1921, by the Imperial Mineral Resources Bureau is proceeding steadily. Those on gold, silver, tin, coal coke and by-products, zinc, and petroleum are now available, and the remainder will be issued shortly.

STONE-DUSTING FOR SAFETY

Mr. George S. Rice of the United States Bureau of Mines, has presented a paper on "Coal Dust as an Explosive Agent" before the Mining Institute of Scotland. In this summary he says: "The watering method I now look on with apprehension; stone-dusting appears difficult and expensive under American conditions, but it now seems to be the safest plan. I am hopeful that the quantity of coal-dust to be treated will be greatly diminished by the use, say, of tight pit-cars or tubs, and possibly even by the use of tight covers, hinged or tightly clamped on over the top of the pit-car or tub. While this seems difficult, it is, after all, no greater step than going from loose and open-end tubs to tight-end cars."

THE ROCKS OF TORONTO AND VICINITY

Part 3 of the report on the stratigraphy and paleontology of Toronto and vicinity, by W. A. Parks and Madeleine Fritz, has been published as Part 9, Vol. 31 (1922) of the Ontario Department of Mines. It contains a detailed description, illustrated by plates, of the fossils found in this vicinity.

FINAL COAL STATISTICS FOR 1922

The Dominion Bureau of Statistics has now published its finally revised statistics on Coal in Canada for 1922, which is available on request by those interested.

Industrial Items

BABCOCK-WILCOX AND GOLDIE-McCULLOCH LIMITED UNITE

The important announcement has been made that Babcock and Wilcox, Limited of London, England and the Goldie and McCulloch Company Limited of Galt and the Babcock and Wilcox Company of New York have organized a new Canadian company under the name of Babcock-Wilcox and Goldie McCulloch Limited with head office and works at Galt. The capitalization of the new company is three million dollars and it will have branch offices in Vancouver, Winnipeg, Toronto, Montreal and the eastern provinces.

R. O. McCulloch is the president of the new company. A. G. Pratt of New York, is chairman of the board of directors, A. R. Goldie is vice president, and Alex. C. Fleming, secretary. The other directors are Sir James Kemnal, managing director of Babcock and Wilcox, Ltd., London, England; W. D. Hoxie, president of Babcock and Wilcox Company of New York. E. H. Wells, chairman of the board of the Babcock and Wilcox company of New York, and A. W. Atwater, K. C., of Montreal.

The new company has acquired the Canadian business of Babcock and Wilcox, Limited and of the Goldie and McCulloch Co., Ltd. except the vault, safe and safety deposit manufacturing business of the later company. The new company will continue the manufacture of high grade boilers, super heaters economizers, stokers and boiler accessories and engines, pumps, turbines, condensers, etc. at their works in Galt. The Goldie and McCulloch Co. Ltd., will continue to manufacture and deal in valuts, safes and safety deposit boxes at the city of Galt.

The Babcock-Wilcox concerns are the largest manufacturers of steam boilers and land marine superheaters in the world besides being important producers of chain grate stokers, steel economizers, coal and ash conveyors, soot blowers and electric cranes.

The principal works of Babcock and Wilcox Limited are at Renfrew, Scotland, where about 5,000 hands are employed and they have branch works at Dumbarton, Scotland, Oldbury, England and in Italy, Australia and Japan. There also allied companies operating in France, Spain, Germany and Prussian Silesia. Branch offices are maintained in England and Scotland and at Brussels, Milan, Amsterdam, Sydney, Melbourne, Mexico, Lima, Rio de Janeiro, Bombay, Calcutta, Tokio, Johannesburg, Shanghai, Warsaw and Moscow.

The Babcock and Wilcox Company have their head office at New York and works at Bayonne, N. J., and Barberton, O., and they in addition a tube mill at Beaver Falls, Penn. where they manufacture boiler tubes. This company employs 3,500 hands.

The new organization will have the benefit of all the patents of the constituent companies as well as of the experimental and scientific work, the wide experiene and engineering knowledge of the British and American companies.

In making the announcement of the completion of the large transaction R. O. McCulloch stated that the safe works would be operated as an independent company under the name of Goldie and McCulloch Co. Ltd. In the meantime they will use the present plant but it is expected that eventually this industry will be housed in a separate plant.

When giving the details for publication Mr. McCulloch said that Babcock and Wilcox Ltd., the Goldie an McCulloch Co. Ltd., and the Babcock and Wilcox C desired to extend to their clients their grateful thank and appreciation of the confidence extended to them the past and expressed the hope that the new compan would continue to deserve and receive it in the future.

Business Started in 1859

It was in 1859 that the late John Goldie and the la Hugh McCulloch purchased the Dumfries Foundry fro James Crombie. The business experienced a stead growth and prospered. It remained a partnership unti 1891 when it was turned into a limited company, th first president being the late Hugh McCulloch, Sr. H was succeeded in 1910 by his son the late Hugh McCul loch, Jr., who remained president until his death in 191 when the present occupant, R. O. McCulloch, was elect to the office.

The late John Goldie was elected manager of Goldi and McCulloch Co. Ltd., in 1891 and on his death i 1896 he was succedeed by his son, A. R. Goldie who sub sequently became vice-president of the company.

The Magnetic Manufacturing Co. of Milwaukee, Wis has recently put on the market a new type "Hig Duty" Bi-Polar Suspended Safety Magnet, designe especially to remove tramp iron and steel from con veyed material. Its primary object is to protect crushing, grinding and pulverizing machinery from damage. It is of simple design and rugged construc tion and should prove useful in many cases in the mining industry.

EFFECT OF CARBON MONOXIDE ON REFRACTORIES

Large-scale experiments with an electrothermic dry distillation process for the treatment of zinc ores, re cently undertaken by the Mississippi Valley Exper ment Station of the United States Bureau of Mines were hampered by the rapid disintegration of con denser linings made of ordinary firebrick. A study of the problem developed that the action of carbon monoxide was largely responsible for the disintegra tion, due to the increase in volume caused by carbon deposition around particles of iron oxide contained in the refractory material. Thus the trouble can be avoided by the use of iron-free refractory material Silica brick or high-grade firebrick free from iron were found to be satisfactory. Results of these expe riments have widespread application as refractory brick must withstand the action of carbon monoxide gas when used in coke ovens, in iron-blast furnaces, in producer gas flues, and in the checker work of re generative furnaces fired with producer gas

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METAL MARKETS

(Prices in carload lots, f.o.b. Montreal, as quoted by Consolidated M. & S. Co.)

Average for week ending Nov. 10

Electrolytic Copper, per lb.	14.78
Zinc, per lb.	8.0
Lead, per lb.	7.58

THE MINING DISTRICTS

By THE JOURNAL'S CORRESPONDENTS

NORTHERN ONTARIO

Cobalt. — The Coniagas has decided to change its cal year from October 31st to December 31st, and interim report has been issued covering the eleven nths ending September 30th. It is stated that the mpany will reach its objective of 1,000,000 ounces for 12 months, and production costs compare favorably th those of the preceding year. In Porcupine, the wray Mine has been unwatered and a considerable ount of work done.. The new three-compartment aft has been completed to the 400-foot level and will continued to a depth of 1,000 feet, at which point ploration on a large scale will be started. To date out $117,000 has been expended on this property. A tal of $116,000 has been spent on the Beaver-Badger d Prince-Davis properties at Cobalt. Operations ve been carried on in the upper levels of the Beaver, om which ore for the mill is being produced. A osscut has been driven at a depth of 1,200 feet, near e lower contact, in order to explore this area. While e operations at the Beaver have not yet resulted in profit, it is hoped that with the additions to the mill w being made, a profit will be realized. The com- ny states that the options taken on properties in e Rouyn and Kowkash areas have been allowed to pse.

C. W. Price, of Cobalt, has entered an action against nson Clements, the finder of the big silver nugget scovered a short time ago in the Gillies Limit. Price ates that he is the owner of the nugget, which was moved from his mining claim.

After carrying on underground operations at the Ge- sse for a number of years, with discouraging results, ie operating company has recently found a shoot of igh-grade ore, which gives considerable promise. everal tons have already been produced and it is xpected a carload will be ready for shipment in a few eeks. An ore-sorting plant has been erected and ore active operations will now be carried on. This iscovery is of considerable importance to the conglo- erate areas in Bucke Township, as it is one of the w finds made immediately north of the 64 fault of he Nipissing, which is generally believed to have cted as a barrier for the silver-bearing solutions.

Good results are now being got by the old Colonial ompany, now known as the Menago Mine. A con- iderable amount of high-grade has been found in the tope recently opened above the 930-foot level, and to ate about 13 tons have been sorted out. The mill re is being shipped to the Mining Corporation for reatment.

South Lorrain. — At the annual meeting of the Hur- nian Belt Company, held in London a short time ago, igh hopes were held out for the development of the Maidens property in South Lorrain. This property is eld by the Canadian Lorrain Silver Mines, Limited, n which the Huronian Belt Company has a controlling interest. The interests associated with the Huronian Belt Company were responsible for the development of he Keeley, and it is believed that conditions at the Maidens are similar to those on the former property. Several veins, carrying silver, have been found, and although it was not to be expected that, at the horizon at which the work was done, any large quantities of silver would be found, increase in values, with depth, has been shown and the workings are still a considerable distance above the contact, where the company believes a zone of enrichment may be found. The Huronian Belt Company owns several claims adjoining the Murray-Mogridge, and it is reported to have taken an option on this property, and is unwatering it. A shaft is sunk to a depth of 200 feet on the Murray-Mogridge, and drifting on that level gave encouraging values.

Mining Corporation Report. — An interim report, dated October 15th, has been issued by the Mining Corporation. The report states that owing to the discovery of new veins and the extension of old vein systems, the Cobalt properties will not be worked out this year, as expected. Production for the year from the Cobalt properties will amount to about 800,000 ounces. The company has a lease on the Peterson Lake, in which some small veins of high-grade ore have been found. To date about three thousand tons of ore has been shipped to the mill. In South Lorrain a new three-compartment shaft has been completed at the Frontier and work has been started from the 5th and 6th levels. It is expected that important results will be encountered from this development work within the next month. Production continues at a satisfactory rate and no effort is being made to create a large production, the attention of the management being concentrated in the development and exploration of the property. Last March the company purchased three claims adjoining the Keeley on the south, and formed a separate company called the Lorrain Trout Lake Mines, Limited, with a capital of 1,500,000 shares of $1.00 each. In view of the heavy expenditures the Mining Corporation was under in South Lorrain, a two-thirds interest in the new company was sold at a price sufficient to more than re-imburse the Mining Corporation for the purchase price, and in addition provided $150,000 cash for the treasury of the new company. A condition of the sale was that the Mining Corporation should retain the management of the new company. A shaft has been sunk to a depth of 275 feet, and silver values were encountered for practically the entire distance, the ore taken out of the shaft being more than sufficient to pay for all the expense of development to date. The company also holds options on 13 claims in the Gillies Limit, on which exploration work is being done. Promising veins have been found and a shaft is being sunk on one of them, but the report states that it is too early to make predictions as to the ultimate value of the properties. In Manitoba geological work was carried on in the Flin Flon area, and 19 claims were staked. These new claims cover possible extensions of the Flin Flon ore bodies and control desirable smelter, mill and town sites and protect the water supply. The situation in Russia is such that it is impossible to estimate the value of the company's property in that country.

The Ontario Government recently ordered preliminary surveys for a railway to South Lorrain, and

has now decided to have a complete survey and location made, and route chosen being that from Cassidy, three miles South of Cobalt. This does not necessarily mean that the railroad will be built, but it will give the government the necessary information on which to make an estimate of the cost.

Kirkland. — Good progress is being made in the development of the Tough-Oakes-Burnside properties, and the main shaft has reached a depth of 900 feet. A new discovery has been made on the 800-foot level in hitherto unexplored ground, which gives indications of being the most important find this year. In addition to a 10-inch pay streak running $80.00, lower values are found over a width of several feet.

Lake Shore has declared a quarterly dividend of 2 per cent, payable November 15th to shareholders of record November 1st.

Porcupine. — McIntyre is reported to have purchased the Platt Veteran claim, at a price in the neighborhood of $400,000. The Platt adjoins the McIntyre on the south and the Schumacher on the east. Some years ago it was diamond-drilled by the Coniagas Company, and while wide mineralized areas were found, the values were very low. It is now believed, however, that ore may be found at depth, as was the case with the Schumacher, which was purchased some time ago by the Hollinger. Mr. J. P. Bickell, President of the McIntyre, is in England and it is believed he may be arranging for the sale of the unissued shares of the company's treasury stock. When the question of increased dividends came up at the last annual meeting, officials of the company stated that the company would shortly be faced with very large expenditures for the sinking of a 5,000-foot shaft and for the necessary equipment, and that to finance these expenditures the money would either have to be provided out of surplus or by the sale of securities. If it were provided from the earnings of the company, increased dividends would have to be deferred for a considerable time. In view of the reported purchase of the Platt it is likely the company is considering seriously the sale of its treasury stock.

Gowganda. — Castle-Trethewey is going ahead with its mill construction, and is making every effort to get the foundations in and the mill building up before the really bad weather sets in. To this end, underground work has been practically stopped in order to utilize the mine crew. Recent developments at the property have been very favorable, and it is understood there is over 2,000,000 ounces of silver in reserve. Mill heads are expected to be in the neighborhood of $50.00 a ton.

BRITISH COLUMBIA

Iron from Smelter Slag. — Interest in the recovery of iron from waste smelter products has been revived by experiments that are being conducted by the Granby Consolidated M. & S. Co., at their works at Anyox. Mr. H. S. Munro states that some encouraging results are being obtained on a laboratory scale. The large amounts of iron that are being wasted in the process of copper smelting have been pointed out repeatedly, an example being cited by Dr. Stansfield, who estimates, in his report to the Royal Ontario Nickel Commission, that 400,000 tons of metallic iron was lost in the production of 22,700 tons of nickel and 14,400 tons of copper from Sudbury ores in 1914.

Advances in Portland Canal Area. — Mr. George Clothier, the Government Resident Engineer for th Northern District, sums up his impression of the las season's work by saying that wherever sufficient ca ital has been available for development, satisfactor results have been obtained in the Portland Canal div sion, and cites the achievements of the Premier, Du well, Indian, Big Missouri, Outsider and B.C. Silve properties. He anticipates that the Outsider propert will be shipping to Anyox before the end of the yea and that the Dunwell and Indian Mines will be adde to the list of shippers next season.

The Premier Company are said to be doubling the treatment plant.

A large amount of diamond drilling and surface prospecting has been done in the district this year an Mr. Clothier is optimistic as to the future. The Home stake Mining and Development Co. has been doing good work on its property at the head of Kitsault river, and investigations are under way at the Bea group on Kitsumgalum lake.

Progress in Yukon. — Captain George Black, repre sentative of the Yukon Territory in the House of Com mons, Ottawa, arrived from the North en route east ward during the latter part of October and reported that the placer output of the Yukon this year would be up to par and that the silver mining industry at Mayo was prospering. Both the Keno Hill Ltd., and the Treadwell-Yukon companies at Mayo, he said, have done well in the short time they have been operating, despite pioneering difficulties involving heavy expenditures. Both have large quantities of ore in sight and the camp is facing a busy winter Capt. Black continued: "Now that transportation facil ities have been improved, operating costs are declin ing and profits consequently will be greater. So far only high-grade ore has been shipped, but I understand that both companies are planning to erect concentrators in the spring. This will permit of the handling of lower-grade ores and will substantially in crease production. A number of individual operators with high-grade ore in sight will work this winter. The companies are prepared to pay cash at the mine for ore, deducting the cost of transportation and smelting. This makes it possible for miners to operate who otherwise would be held up through lack of money. All this ore is being produced by United States' capital and goes out of Canada to smelters in the United States. The Canadian smelters do not offer attractive terms and Canada is not getting the benefit that might be expected from a purely Canadian product."

Granby Wages Reduced. — H. S. Munro, vice-president and general Manager of the Granby Consolidated Mining and Smelting Co., states that the Copper Mountain mine and the Allenby mill will be closed until the copper market improves. Employees, who went from Anyox to this mine and plant, will return to the company's northern operating centre. Notice also has been given that, owing to the low price of copper, wages must be reduced and this re-adjustment will be effective on and from the 15th November next. This means that the scale of wages under which the company was operating prior to March 16th last will again be applied.

Objections to Tax.—There is a possibility that the Act passed recently by the Government of the Province of Alberta imposing a tax on mineral lands of that Province will be disallowed by the Dominion Government. Several of the land owners seriously af

ected, among whom are the Hudson's Bay Company, he Canadian Pacific Ry., and the Edmonton Land ompany, are petitioning against the measure at Otawa on the ground that it is unconstitutional and unreasonable and designed, not so much to derive revenue as to confiscate mineral lands. The Province akes the position that it is a form of direct taxation hich it is fully empowered to impose.

Coal Mining Depressed. — "Due to the competition f foreign fuel oil, the coal industry of the Province s in a depressed condition." This statement appeared n the Speech from the Throne at the opening of the egislative Assembly of British Columbia. Whatever ay be said, regarding the cause of the depression, hether it is wholly or only in part attributable to he increasing use of fuel oil in the Province, there is o doubt that the coal trade is slack and that the industry is suffering.

Since last March the coal mines of Vancouver Island ave been working about two-thirds time, while the verage for the year to date is approximately three-uarters time. In the Nicola-Princeton field the Middlesboro Collieries have been running some fifteen days a month, but the Coalmont Collieries, in marked ontrast to other producing mines, has been working lmost full time. At Coal Creek, Crow's Nest Pass, he mines have been working about 20 days a month ince the beginning of the year, the Michel Collieries ave been able to get in two-thirds time, and the Corbin Coal & Coke Co., an average of half time since the eginning of the year.

A comparison of the production of the different coal ields of the Province for the first ten months of 1923 ompared with the same period last year shows that n Vancouver Island there has been a decrease of 166,006 tons; in the Nicola-Princeton field a falling off f 35,343 tons; while in the Crow's Nest Pass there as been an increased output of 161,980 tons. The mprovement indicated by the last figure is accounted or by the fact that in 1922 there was a three-months trike in the Crow's Nest Pass, while this year no labor rouble has interfered with the activity of the mines.

Welsh Anthracite for Vancouver. — In Vancouver, he suggestion that ships coming to the Pacific for grain and other cargoes for Europe should carry Welsh anthracite coal for sale in the West is meeting with favor. It is believed that the demand for shipping to carry Canadian exports would be more readily met f Pacific bound vessels were assured of a market for British coal which they might, under the circumstances, take on as distress cargo at such low transportation rates as would permit the fuel to enter into competition with the local coal. The possibility of the proposal is being investigated and some business men are confident it is practicable.

NOVA SCOTIA

H. J. McCann's Appointment. — Mr. H. J. McCann has been appointed General Manager of the Dominion Coal Company in the re-organization now taking place. Mr. McCann came to Sydney in 1899 and was with the Dominion Iron and Steel Company until 1904 when he went over to the Dominion Coal Company as a member of the executive staff. Later he returned to the service of the Steel Company and for years was Purchasing Agent. After the formation of the British Empire Steel Corporation he was in charge of all purchases for both companies and of the negotiation of contracts for all additions to their plant and equipment. He was assistant to Mr. Workman during his term of office as president and later he was made Assistant General Manager of the Dominion Coal Company.

There were very trying years, as there was much reconstruction to be done after the war ended. It took a firm hand and a clear head to keep off the shoals and rocks and to steer an even course. No doubt a man of less self-confidence, determination and mental capacity would have been swept away by the turbulent currents of these years. Mr. McCann came successfully through them, not without loss of physical energy, but with his mental vigor unabated, and with a larger experience of men and affairs. Five years of such life in such a time may have placed him in a position where he was misunderstood by his workmen. Certain it is he was not misunderstood by the Corporation he serves, who know that every ounce of the energy and all his faculties and extraordinary ability has been spent in their service. Mr. McCann holds very generous views of how workmen should be cared for and treated, and possibly in time when he has had an opportunity to work these out, he may be more fully appreciated.

Mr. Wolvin Announces Pension Scheme.—President Wolvin of the B. E. S. Co. did a most generous act when, without solicitation on the part of the workmen, he freely and voluntarily offered a pension to old employees of both Steel and Coal Companies. Such deeds on the part of a large corporation are calculated to form and cement a friendship between employer and employee which will go far to tide over the difficult days when trade depression bears on the spirits with a weight that eats into the heart and creates much bitterness. They present another side of the "soulless corporation" from that which we have been taught to know. Already the faces of aged workmen are lit up with the smile of a new hope—glad news has wakened a song where care had dwelt before, and the deep gloom pictured by Canon Scott has vanished before this earnest of a better day.

This pension plan provides for a pension payable:

(1) To any male employee who has been 25 years in the service and has reached the age of 65 years or more and who is retired from service either at his own request or the request of the employing officer.

(2) To any female employee who has been 25 years in the service and has reached the age of 55 years or more and who is retiring from service either at her own reques tor the request of the employing officer.

(3) To any employee who has been 15 years in the service and who during the course of his employment has become permanently and totally incapacitated for further service.

(4) The Board of Directors of the Corporation may at its discretion instruct and direct the Pension Committee to include in the pension scheme employees whose length of service has not reached the limits above provided for or employees who may, for other reasons be ineligible, for pensions under these regulations.

The amount of pensions payable monthly to persons retired under the provisions of the fund will be at the rate of one per cent. of the average monthly pay received by them during the last 10 years of their service multiplied by the number of years of their entire service.

To illustrate the working of these rules consider an

example: An employee has been in the service 30 years and during the last 10 years has received $1,000 per annum or $83.23 per month. His monthly pension would be one per cent. of $83.33 or $0.83 multiplied by 30, which equal to $25, provided, however, that no pension shall be more than $75 per month.

This fund will be administered by a Pension Committee appointed by the Board of Directors.

A. S. MacNeil Promoted. — In announcing the appointment of Mr. A. S. MacNeil General Superintendent of all the mines of the British Empire Steel Corporation, Mr. Wolvin said: "Although Mr. MacNeil is still in the prime of life, he has to his credit thirty years of uninterrupted service in coal mining. From a working miner he has advanced through every stage of training and experience to his present responsible position. His career is a striking example of the opportunity that is open to Nova Scotians who have the brains, the vigor and the determination to aspire to and attain positions of the highest responsibility and importance and to take their places in the ranks of those who are doing their part in developing the wonderful resources of their native province."

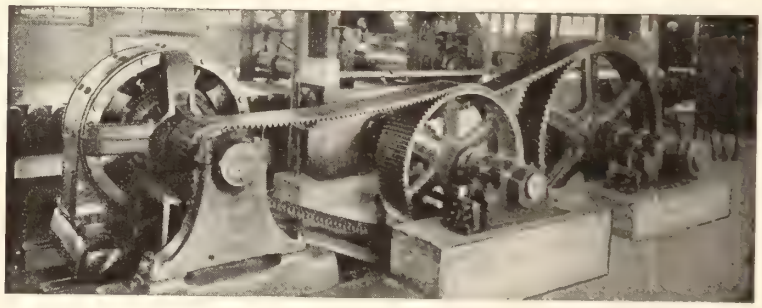
The *Canadian Mining Journal* has had some good things to say of Mr. MacNeil in the past, and is pleased to see that he is still rising in his profession, and trusts he may continue until he reaches the top.

Provincial Police a Useful Body. — The Commission to investigate the strike that occurred at the steel works last July has heard some startling evidence during their sittings. F. W. Gray presented the case for the Corporation, reviewing it from the beginning to the end. The prolonged agitation leading up to the strike, the division in sentiment among the workmen, the mob violence after it began, the desperate attempt of armed and masked workmen to intimidate all workmen refusing to strike, the precarious position of the coke-ovens and the attempted destruction of the water mains by dynamite, makes alarming reading even at this late date. The effective work of the mounted Provincial Police stands out prominently to the credit of the Province and points the way to the proper protection of Provincial industries in future struggles. Students of the case have no hesitation in stating that a Provincial body as formed last July is better fitted to give protection than the military forces. They are more mobile and their training, being along different lines, enables them to act quickly and deal with each situation as it arises more promptly than the soldier. If the work of the Commission does nothing else than give the public an insight into the true condition of affairs at the steel plant, it will have done much to prove the necessity of the protective forces used at that time.

Walter Herd is Chief Mining Engineer.—Mr. Walter Herd has been appointed to the position of Chief Mining Engineer of B. E. S. Co. Mr. Herd is well equipped for his duties, which lie in a very difficult coal field and which require just such training and experience as he has had in British collieries. His success in the undersea areas of Cape Breton is well known, as is also the success attained in the Springhill collieries, where he advised a change in the method of mining to meet bump conditions. The thick coal seams of Pictou county present sufficient complex problems to take up the time of any engineer, yet they now form only a part of Mr. Herd's extensive territory.

MORSE CHAINS

THE MORSE "ROCKER JOINT"



A few of the Morse chains in use at the Raymond Lead plant

Using chain drives speeds up production, cuts belt expense and overtime wages and operates with practically no repairs.

Write for Booklet

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O.W. Ludwig, *Plant Superintendent of the Raymond Lead Co., Chicago, says:*

"Thirteen years of service without a repair is our experience with two 100 H.P. and ten 20 H.P. Morse Silent Chain Drives

"When we moved into our present plant thirteen years ago, we installed the present Morse equipment of silent chains for our two lead mills and ten hydraulic pumps. We had always previously used leather belts, but not without considerable trouble. For instance, if the operator was not careful — and gave the motors too great a load, the leather belt would slip and in some cases burn out. While with the Morse Chain Drive we overload them at times up to 15 H.P. without the slightest trouble.

"When we used leather belts on the hydraulic pumps, if a pump packing suddenly gave way, the water would squirt all over the pump as well as adjoining pumps, causing the leather belts to get wet. This often necessitated a shut-down on 3 to 4 pumps to dry out each belt, thus causing a loss of time by the men, which resulted many times in paying overtime to catch up on the work. Of course, with our Morse Chain Drive we have no such trouble—this positive drive prevents slippage and is not affected by water.

"Leather belts lasted us 2 to 3 years at the most, while our Morse Chain Drives have already lasted 3 to 4 times that long and seem good for many more years. So Morse Drives have cut our expense materially, speeded up production, cut out overtime wages and saved floor space, for they operate on shorter centers."

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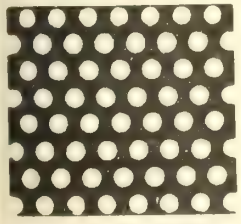

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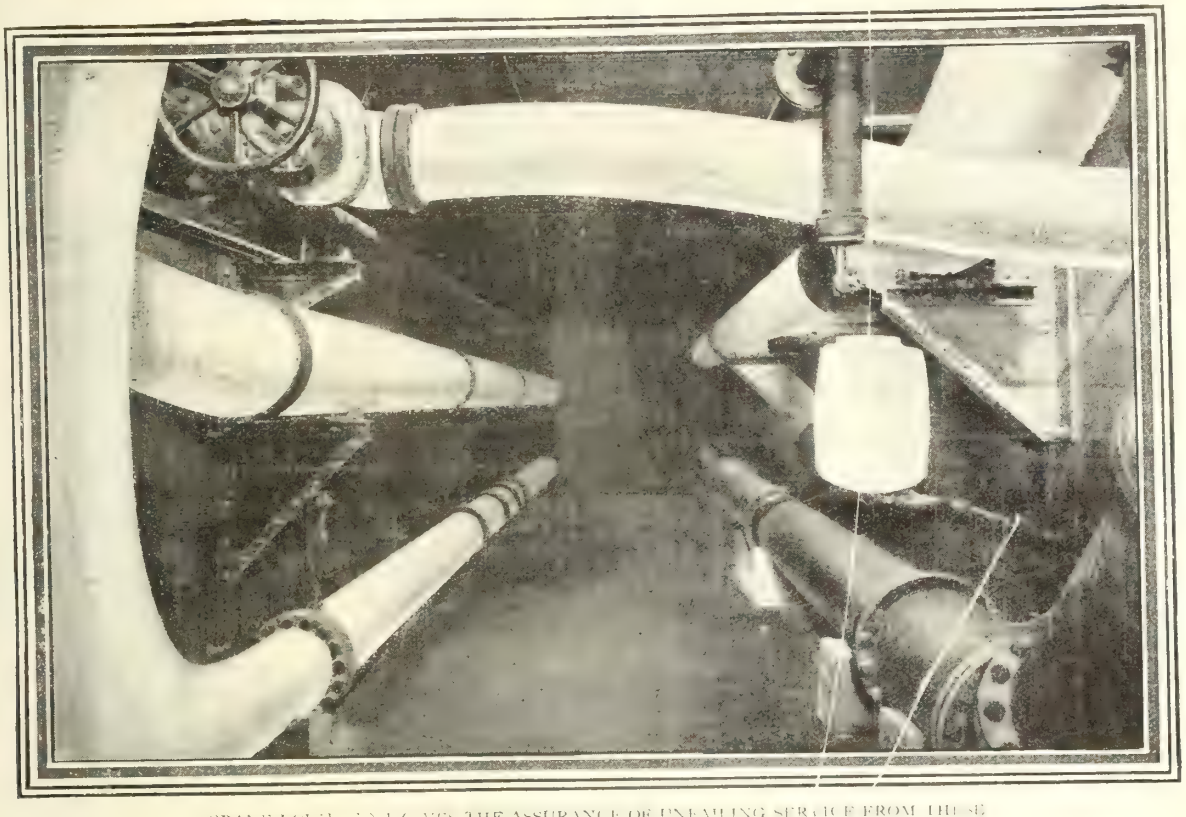

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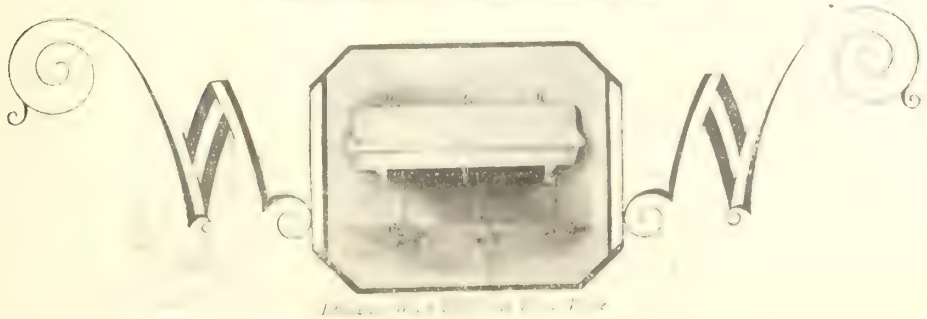

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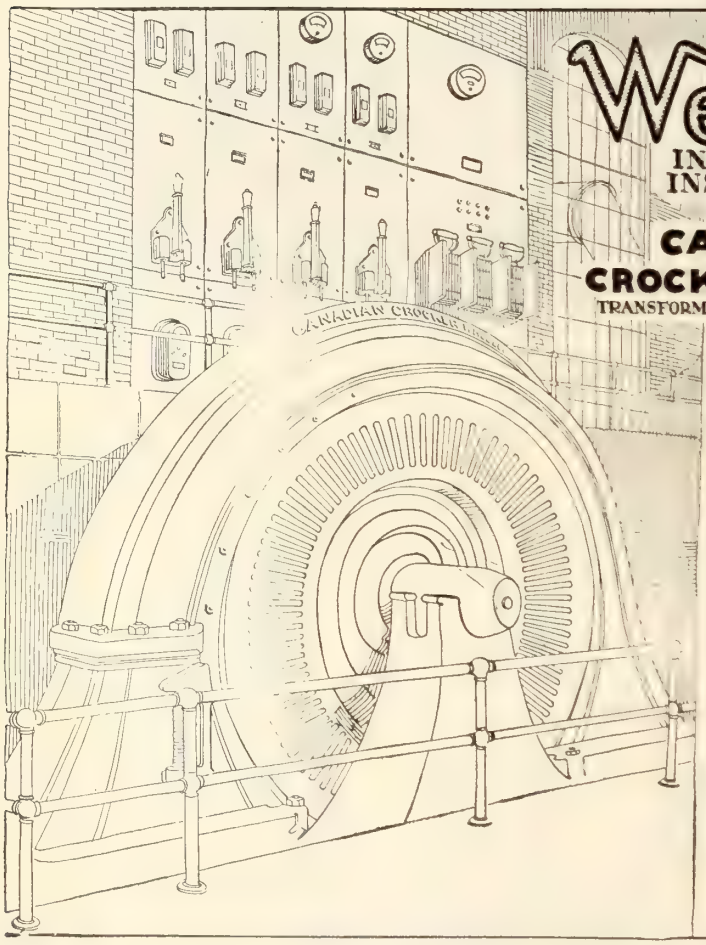

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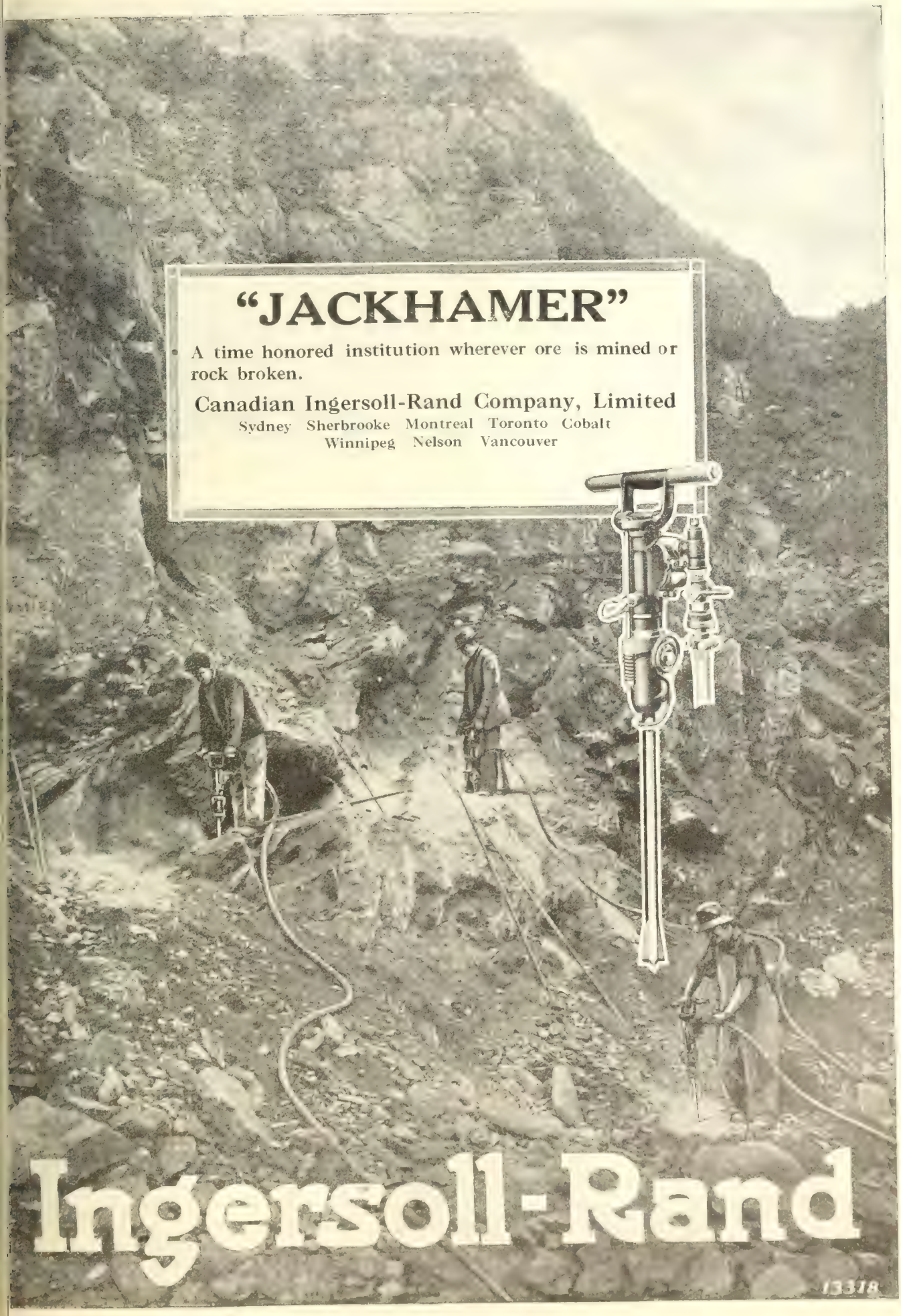
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Economic Minerals

In addition to the above, practically all economic minerals (coal and tin excepted) are found in Ontario: — actinolite, apatite, arsenic, asbestos, cobalt, corundum, feldspar, fluorspar, graphite, gypsum, iron pyrites, lead, mica, molybdenite, natural gas, palladium, petroleum, platinum, quartz, salt, talc and zinc. This Province has the largest deposits on the continent of talc, feldspar, mica and graphite.

Building materials, such as ornamental marble, limestone, sandstone, granite, trap, sand and gravel, lime, Portland cement, brick and tile, meet every demand.

Mineral Production

Preliminary returns show the output of the mines and metallurgical works of the Province for the year 1922 to be worth $62,202,169, of which the metallic production was $38,190,711.

The following figures show the growth of Ontario's mineral industry by five-year periods since 1891 when a Bureau of Mines was first established.

Year.	Value.	Year.	Value.
1891	$4,705,672	1911	$41,976,797
1896	5,235,003	1916	65,303,822
1901	11,831,086	1918 (Maximum war output)	80,308,972
1906	22,388,383	1921	48,128,387

Dividends.

Dividends and bonuses paid to the end of 1922 amounted to $28,096,699 for gold mining companies, and $86,238,185 for silver mining companies or a total of $114,334,884

Mining Regulations

A miner's license costs $5.00 per annum, and entitles the holder to stake out in any or every mining division three claims of 40 acres each. After performing 200 days' assessment work on a claim, patent may be obtained from the Crown on payment of $2.50 or $3.00 per acre, depending on location in unsurveyed or surveyed territory.

Assay Office

The Provincial Assays Office at No. 5 Queen's Park, Toronto, is maintained by the Department of Mines for the free identification of minerals, free assays under the provisions of the Mining Act of Ontario, and also for general assay work as per the Schedule of Charges which may be obtained on application.

Temiskaming Testing Laboratories

The Department maintains, at Cobalt, an ore sampling and testing laboratory which is now prepared to receive parcels of gold ore from 100 pounds upward, and after sampling and assaying the same to pay to the shipper the value thereof, less treatment charges. The purpose is to afford a market for ores extracted by prospectors and others in developing their mining claims, enabling them to obtain funds which they can use for further work and to report on the most satisfactory method of treatment. Fuller information may be obtained on application to the Manager, Temiskaming Testing Laboratories, Cobalt, Ontario

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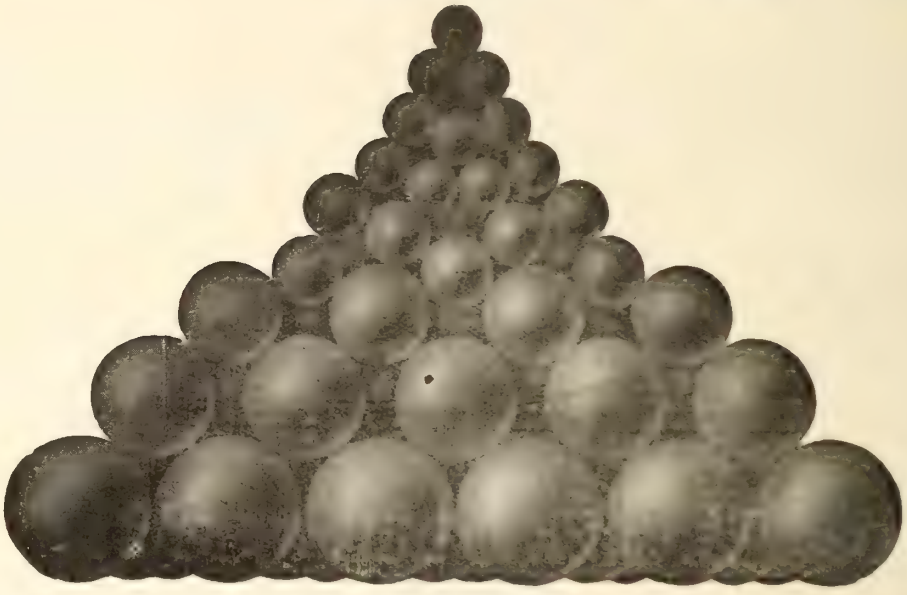

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:-: EDITORIAL :-:

WO OPEN DOORS—AND THE KEY TO ONE

Mr. J. A. Robb, Minister of Immigration at Ot-a, has announced that he will open wide the door nmigrants from Europe, provided they measure up ertain physical and moral standards. The adop- of such a policy will, no doubt, stimulate immi- ion; but how far will it result in filling up the nt places of our land? Numerous writers and kers have pointed out pertinently during recent ths that there is another open door, through h our population is being diminished quite as fast is being increased by immigration.There is virtually restriction on the movement of Canadians to the ted States; in fact our neighbors welcome Cana- ns, for their brain as well as for their brawn. At sent there is an active demand for unskilled labour e, so it is more than likely the new immigrants to ada, or their immediate predecessors, will cross border when they have been here long enough earn the ways of this western world and to become ficient workmen.

Thus has Canada become a training ground for Am- an labour. The opportunities here for earning a d livelihood are not equal to those in the United tes.

t is even more important to keep the population have got than to induce further immigration. Native n Canadians of all classes are likewise lost to Can- in large numbers annually. The last Dominion sus showed an emigration of appalling dimensions, l recent official returns show that the movement tinues unabated. Unless this leak is stopped, the spect of increasing our population materially dur- a reasonable term of years is small indeed.

t is obvious that material prosperity, including re- nerative employment, a high standard of living, l the hundred-and-one incidental features of oom'' times, provide the chief attraction in the ited States. Our problem is to match these attrac- ns in Canada. In numerous instances our natural ractions are the equals of those of our neighbor; but have failed so far to make similarly good use of m. We wish to point out a present opportunity.

A gold boom, if well founded and of large dimen- ns, will attract and hold colonists, industrial work- s and others in numbers quite out of proportion to e numbers actually employed in the mines. It en- ges the markets for everything from potatoes to s, or from cabbages to compressors. If the gold mining industry should be of sufficient dimensions, it might even dominate the national life, as it does in South Africa. Already we have in our north country gold mines whose annual output is one-tenth that of the Rand. Unless all signs fail, the output of the mines at present established will be doubled within four or five years to equal one-fifth of the South African production. If geological reasoning is valid, many new mines will be established along the hundred and fifty miles of gold belt, adding impetus to the boom and giving it further justification.

The gold boom has commenced. If our legislators will continue to aid development during these early stages, as practised always by the authorities in Ontario and as promised recently by Mr. Perrault and his colleagues in Quebec; if public authorities and the public press will combine with private interests to suppress the ''wild-catting'' that has cost us so dear on former occasions; if our mining laws and regulations retain the character of stability, justice and liberality by which they are known at present; if Canadian investors will, by a discreet and well-planned use of their funds at the direction of competent mining men, encourage foreign investors to add their quota; then we may find that, almost before we know it, the tide of prosperity and of immigration will have changed in favour of this land with a golden present and a golden future.

PROPOSED BOUNTY ON IRON ORE

Hon. G. Howard Ferguson's announcement in Sault Ste. Marie last week dealing with Ontario's iron ore problem is an important step in the building up of an iron ore industry in the province. He stated that at the next session of the legislature in Toronto a move will be made to provide the bounty recommended by the committee on iron ore appointed by the late government, adding that he believed the federal government would contribute to this bounty. He also committed himself on this occasion to the appointment of a geologist whose special duty it would be to make a study of the province's iron ore supply.

We are pleased to know that Mr. Ferguson thus endorses the conclusions of the advisory committee, who have searched long and faithfully for a solution of the problem committed to their care. When this committee was appointed sixteen months ago, we pointed to the fact that, since it contained no members qualified by training and experience to pass judg

ment on this problem in its technical aspects, the services of such a specialist should be retained on behalf of the public. The occasion warrants the addition of such an one to the staff of the Department of Mines, and Mr. Ferguson has promised that this shall be done. Later we expressed the opinion that the committee's principal conclusion must concern the practical question of a bounty, and hoped they would recommend it. It is gratifying to know, not only that they have recommended the bounty, but that the Premier backs them.

We are convinced that any reasonable measure that will ensure a supply of native iron ore to the blast-furnaces in Ontario will repay handsomely its expense to the public. Industrial activity in this country is not up to par, and students of affairs tell us that there is a still duller time ahead. The slackness of industry is reflected in a depression in agriculture, progress in settlement is halted, and the exodus to the United States is speeded up. By means of the bonus scheme that is proposed an industry of first-rate dimensions will be created as fast as our factories can turn out the machinery required, employment will be assured directly for some thousands of workers, and the country will be saved a bill of several millions annually for imported iron ore. The cost of this in taxes will be small in comparison with the benefits, and it is considered by competent judges that the total cost will be more than repaid to the country by the time the bounty expires.

It should be borne in mind that the Algoma Steel Corporation have offered definitely to build and operate at the Helen mine in Michipicoten a large plant for calcining and nodulising siderite ore, provided a bounty of adequate dimensions is granted for a term of, say, twelve or fifteen years. The Corporation has, at the cost of several million dollars, proved conclusively the commercial utility of this process, and has likewise blocked out sufficient ore at Helen mine to feed a 1,000-ton plant for a couple of centuries. With the present competition from United States ore, such a plant cannot meet expenses, including interest charges. If the bounty is made sufficient to meet these interest charges and to wipe out the cost of the plant before it expires, the Corporation is prepared to find the capital required, and is willing to trust to favourable developments in the future for its profits. This is a frank and a fair proposal, and we hope to see it taken up within the next few months.

The problem of treating low-grade magnetic ore is not so far advanced as in the case of siderite, but is equally promising. It is here that the aid and advice of an all-round specialist in iron ore will first be required. The experimental work at Moose Mountain has reached an advanced stage, but has not yet reached the position of stability effected in the case of siderite by years of commercial operation at Magpie mine. It may be that the experiment at Babbitt, Minnesota, will supersede the work at Moose Mount We are confident that further concerted and w directed effort will solve the problem of this magn ore in short order.

For progress in the future, we look mainly to iron ore specialist who is to be appointed. As m tioned before in these pages, the various eff wards the establishment of an iron ore industry Ontario have lacked coördination, and hence m effort has been misdirected and wasted. For insta much has been done to suit Canadian ores to Ameri blast-furnaces, but little has been done to develo ferrous metallurgy that will suit our own ores. first duty of the new officer of the Department Mines will be, of course, to unite and to continue present efforts to provide an indigenous ore sup for the present furnaces. But we look forward time when, through the united efforts of all thos terested, a more suitable, a more profitable and a tinctively Canadian method will be found of turn our iron ore into iron and steel.

TRADE WITHIN THE EMPIRE

It is no disrespect to the other Premiers of the Ov seas Dominions to say that General Smuts, the P mier of the Union of South Africa, is easily the standing figure among them. He is marked out that position, not only by his unequalled experience the responsible conduct of public affairs of the magnitude, during the most momentous period modern history, but also by his proven sagacity a capacity, combined with very unusual gifts of thought and concise expression. And, at the open session of the Imperial Economic Conference, he w characteristically, to the core of the inter-Impe trade question and showed along what lines the s tion of that much canvassed problem should be sough

Addressing himself to Sir Philip Lloyd-Grae president of the British Board of Trade, he sa "The assumption of the American debt seems to to be an event which is bound to call for recons tion of many of your old policies. The United St has not only erected a high tariff wall around her fr tiers, and debarred many of our products from go to her, but she now claims, and rightly claims, pay ment of a very large amount of money annually fro this country. The necessity under those circums is forced upon this country to develop the Empire far as possible, to turn its attention to those p of the Empire especially which are capable of gr development, and of producing those articles which great quantity you still take from America. You hav mentioned the matter of cotton. Cotton is a raw ma terial which in the largest quantity we still take fro the United States, but that is not the only raw ma terial which we take from her. She supplies us w

y with cotton, but very largely with copper, and y largely with tobacco. In fact, she has supplied and still continues to supply us with a very large nber of different raw materials which the Empire perfectly capable of producing if properly devel-d."

Premier Smuts had previously sounded emphatically right note in laying stress on the great urgency of uring a settlement in Europe. This is a matter with very direct bearing on the subject of inter-Imperial de. At the best, any outlet Great Britain can find her manufactured products within the Empire will be sufficient for her needs, in the light of the gig-ic task she has undertaken as regards the repayment the debt to the United States. On this head Premier uts spoke words of wisdom. "I fear," he said, "that ess there is a real recovery in the world, unless you succeed in re-establishing the trade and commerce the world, you may find you have undertaken an in-erable burden for this country. Our duty, therefore, o move heaven and earth to have peace re-established Europe." He added that it was a policy of desper-on to suppose that Europe could be left alone in her sent stress. "You cannot have even the possibility of ing the American debt, unless you can restore peace-conditions in Europe."

For our part, we are persuaded that, unless peaceful nditions in Europe are restored, we cannot have that equate extension and expansion of inter-Imperial de for which we are looking. For a really full devel-ment of inter-Imperial trade is, and must necessarily dependent, to a great extent, at any rate, on the toration of conditions approximating to the normal other parts of the world. Any view of the question ich does not have regard to this fact is a very short-hted view.

By this we do not, of course, mean that the fostering trade within the Empire shall be postponed to the toration of conditions approaching the normal else-here. On the contrary, it is absolutely certain that e energetic development of Imperial resources and er-Imperial trade ought to be taken in hand forth-th, and that, if it is so taken in hand, it will be bound, the long run greatly to assist, even though indirectly, e restoration of those other markets, the present limit-on of which is affecting so adversely the purchasing wer of the whole British Empire.

THE OIL WELL AT WAINWRIGHT

The long search for oil on the western plains would pear to have been rewarded at last in well No. 2 of ritish Petroleums Limited. A correspondent who has st inspected this well gives us some particulars. It in Section 30, Township 45, Range 6 West of the 4th eridian, about six miles north of the town of Wain-right, Alberta. The well has come in at a depth of 030 feet with a daily capacity of sixty barrels, from sand seventeen feet thick, to which the name "Cre-lle sand" has been given, in honour of the driller who first struck it. We expect to have further details for announcement in an early issue. Meantime we wish to congratulate those whose faith and pertinacity have resulted thus fortunately, and we trust that further search will reveal there the long sought and well hidden oil field that has eluded so long the geologist and the driller.

A BANKER ON MINING

The Royal Bank of Canada has someone on its staff who has grasped in part the significance of mineral development in relation to the all-round development of our unused resources and of our industrial system. On another page we reproduce the resumé of conditions in northern Ontario and Quebec printed in the Bank's November news letter. Its concluding paragraph points out how important it is that the vast pre-Cambrian area that now separates East and West should become peopled and productive, that Canada may be in fact an economic and social as well as a political unit.

The writer of this article in the Royal Bank's review does not, however, mention some other points that are of equal importance in the future and of much greater importance in the years immediately before us. It has been truly said by students of human affairs and human history that the mining industry is the principal agency of civilization and of material progress. Not only this, but a thriving and expanding mineral industry provides what is probably the greatest possible stimulus to the development of other industries and to the settlement of the land.

This is not merely a matter of history; it is being exemplified today in more than one quarter of the globe. In South Africa industrial progress and agricultural prosperity are directly dependent upon the gold mines of the Rand. This has its counterpart in the fact that the larger part of the Union's public revenue is derived from leases and taxes from the mines. In time the gold deposits will be worked out; but by that time mining of the more prosaic metals and minerals, industry and agriculture will have been developed into a self-supporting unit. In the heart of the continent, far to the north in the Belgian Congo, the first large white community is being settled round the mines and smelters that promise some day to produce a large part of the world's copper. We have referred before in these pages to the part mining development took in opening up Australia and the western United States to settlement.

Our bankers and business men will do well to study this subject in its broadest aspects; it will repay them handsomely to do so. Then it will become the rule, not the exception as it is now, to find that their public utterances and their private transactions touching the mineral industry demonstrate a working acquaintance with its methods and an adequate appreciation of its true worth.

Mining Activities in The Pas Mineral Belt

Progress of Operations During the Season of 1923

By J. A. CAMPBELL*

With the exception of certain years of the war period, when copper production was specially necessary, there has been more actual mining work in The Pas mineral belt during 1923 than in any previous year. Particularly has Herb (or Wekusko) Lake come to the front during this period. The work of developing ore on the Bingo property has continued steadily, twenty-five to thirty men being employed working in three shifts per day. A full equipment of machinery of the latest improved type for this work was taken in and installed in the early months of the year, and was put into operation in May.

Now the main shaft has been sunk to 420 feet and approximately 400 feet of drifting has been done. This work shows the quartz to have increased in volume at depth while the values appear to have been maintained. A recent Government report states:—

"In the free gold showings in the veinstuff, as for instance below the 200-foot level, the gold appears to be associated mainly with the galena, but is very clean, and presumably almost completely free milling."

The satisfactory results being obtained at the Bingo are giving an impetus to mining development in the Herb Lake district generally. Properties such as the Kiski and Northern Manitoba, on which shafts have been sunk and considerable development work done, have been intensively prospected and other gold-bearing veins found. The Wekusko Mines, Limited, a Saskatoon corporation, are actively developing their property at Broad Bay and a shaft is being sunk under contract.

What those interested in this region are looking forward to now is the consummation of a deal whereby active work on the Rex will be resumed at an early date. A shareholders' meeting is announced to take place at Boston shortly to consider a proposal whereby the present interests, hitherto sometimes conflicting, will be turned over to a well-known Canadian mining concern and thereby consolidated. It is on the boards that other nearby properties may subsequently be included with it. The Rex is in good condition for operation but is considered to have been held back through lack of capital and to some extent through lack of co-operation among those interested. In any event, this valuable property cannot much longer remain inactive. Resumption of work thereon, taken in conjunction with that being done on the Bingo, will undoubtedly result in other important developments taking place in this camp.

The withdrawal last fall of a prominent mining company from the Elbow Lake district, where it had an option on the Murray property, was looked upon at the time as a matter of serious import. However, the owners were not discouraged and continued the work of examination, which had hitherto been of a somewhat superficial nature. Their efforts were rewarded when the shaft was sunk to 42 feet by the discovery that the country rock carried considerable gold values. A new organization was formed to handle this property and the work will continue. On the Garbutt zone, farther north, additional prospecting has uncovered a shoot in which there are abundant free gold showings.

Owing to the weakening of the copper market there has been less activity in copper areas than would otherwise have been the case. The Manitoba Metals Mining Company have been diamond-drilling on their Flin Flon properties all summer and Dr. Armstrong with a considerable party has been engaged for the company in work of intensive prospecting in the district. It is reported that a successful season has resulted.

A noteworthy feature in connection with the year's operations is the number of mining engineers who have visited the district and made examinations of properties. Among the companies represented by these are some of the largest and most important in the United States and Canada.

An exceedingly important item from the standpoint of the mining man is the matter of transportaiton facilities. In this respect Herb Lake is now very favourably situated. There is a weekly train service from The Pas to Mile 82 on the Hudson Bay Railway, and from that point to the lake, a distance of eleven miles, is a road built by the provincial government. A road gang has been working steadily on this all summer, draining, grading, gravelling, etc., and the road is now in good condition for traffic. Besides, a reliable telephone service is in operation between The Pas and the mines and intermediate points.

DEVELOPMENT OF NEW HYDRAULIC CLASSIFIER

In the work on ore classification problems in treating complex lead-zinc ores of the Coeur d'Alene and other mining districts of Idaho, an improved type of hydraulic classifier has been developed by A. W. Fairwald, attached to the Moscow, Idaho, field office of the United States Bureau of Mines. It is believed that this new classifier is more efficient than any now in use, and that it represents a distinct advance in metallurgical treatment. The new classifier has been tried out on a commercial scale in one of the mills, with the result that a greatly improved grade of classification is being effected. It is believed that table concentrations will be greatly improved when the tables are fed with well classified material. It also appears that with this type of classification, galena and sphalerite may be separated on tables into marketable products, and that much of the fine grinding and difficult flotation treatment of complex lead-zinc ores may be eliminated.

Intense interest in the trial has been manifested throughout the district, and it is expected that many other mills will install this superior device and thus improve their products and conserve mineral now lost in the reject.

The fact that there is a great lack of knowledge as to the importance of proper classification of ground ore in preparation for table concentration led to the undertaking of these studies by the Bureau of Mines. Many forms of classifiers are in use, but generally there is an altogether mistaken notion as to the grade of work being done by the classifier in use. All sorts of devices are called classifiers and a variety of procedures in practice are called classification. There is no unanimity of opinion among mill men or investigators as to the relative advantages of a natural product feed, a sized product feed, and a classified product feed to concentrating tables. However, fine grinding of the entire mill feed is coming to be looked upon as a procedure leading to difficulties and to loss.

* Commissioner of Northern Manitoba.

Natural Gas and Petroleum Resources of Western Canada

Helium—Its Occurrence, Recovery and Use

By NEWTON W. EMMENS

(Continued from page 920)

Physical Properties of Helium

Helium is the second lightest substance known, is colorless and odorless, has an atomic and molecular weight of 4, and is chemically inert. Its density as compared with air is 0.1368 (that of hydrogen is 0.0696); it weighs 0.0112 pounds per cubic foot (hydrogen weighs 0.0056 pounds per cubic foot) but has a buoyancy in air as compared with hydrogen of 93 per cent. For many years all attempts to liquify it failed, but in 1908 H.K. Onnes, a Frenchman, succeeded. He found that it liquified at a temperature of -451.3 deg. F. (about 8.1 deg. F. above absolute zero), and had a density, in the liquid form, 0.122. It is soluble in water at a temperature of 68 deg. F. to the extent of 1.4 per cent. by volume, but is insoluble in absolute alcohol and benzene. Helium is present in all radio-active minerals and springs and is also present in many rocks that form the earth's crust.

Interesting investigations carried out by Rutherford, Ramsay, Soddy, Boltwood and other scientists go to show that helium is one of the end products, and lead the other, of uranium and that this substance (uranium) may be provisionally considered to be a compound of lead having the formula $PbHe_8$; also that radium is one of the intermediate products produced during the decomposition. Those who are interested in this phase of the subject and want additional information will find it in the "Proceedings" of the Royal Society, Vol. 72, p. 204, 1903, in a paper written by Sir William Ramsay and Frederick Soddy; and in "Science", new series, Vol. 49, p. 1, 1919, in an article by T. W. Richards.

Extraction by Refrigeration

The separation of helium from the other gases with which it is associated in natural gas is accomplished by refrigeration, in which the temperature is reduced to the point where all the constituents of natural gas are liquefied with the exception of helium. The temperature required to accomplish this depends upon the composition of the gas being treated, but it is very low, as may be seen from the following table, which gives the liquefying temperatures of the gases that are met with in natural gas:

Name of gas	Temperature required to liquefy at atmospheric pressure
Methane	—265° Fahr.
Ethane	—135° "
Propane	— 49° "
Butane	+ 34° "
Pentane	+ 97° "
Carbon dioxide	—108° "
Oxygen	—293° "
Nitrogen	—317° "
Hydrogen	—423° "
Helium	—451.3° "

If at the same time the gas is being cooled it is compressed the temperature of its liquefying point is raised.

In order to obtain the low temperatures necessary to liquefy the gas, advantage is taken of the results obtained by Professor W. Thomson (Lord Kelvin) and James Prescott Joule in their experiments in the liquefaction of gases. They found that if a gas under pressure be suddenly expanded there is a great drop in its temperature, the amount of which depends to a great extent upon the difference in pressure between the compressed and expanded gas. This is known as the Joule-Thomson effect.

Linde Process Most Successful

In the Linde process of extracting helium from natural gas advantage is taken of this Joule-Thomson effect. The gas is compressed to about 3,000 pounds per square inch cooled and then expanded through a small orifice in a suitable apparatus to about 300 pounds, thus causing a big drop in temperature. This cold gas is used to cool another lot of compressed gas, which in turn is expanded and brought to a still lower temperature. By repeating this cycle over and over again, as is done in the Linde process, a point is reached when the temperature is reduced to the liquefaction point of the gas being treated, and the condensed portions can be drawn off from the uncondensed. In actual operation of the plant it was found possible to obtain helium of a purity of 70 per cent. on straight runs, and by taking this helium and re-processing it, a final purity of 92 to 95 per cent. was obtained.

The Claude process makes use of the cooling effect obtained by making the compressed gas do work, by causing it to expand in the cylinder of an engine, and making use of the power thus obtained. Although in this Claude cycle the Joules-Thomson effect is made use of, its value is greatly reduced because the initial pressure of the gas is much lower than in the Linde system, the expanding of the gas in the engine being relied upon for the maximum effect. The plant using this process succeeded in producing helium of a purity of 62 to 70 per cent. and this gas was re-processed in the Linde plant, bringing it up to a purity of 93 p.c.

The Norton process makes greater use of the cooling effect by making the gas do work in multiple-expansion engines and uses a lower initial pressure than either of the other systems, utilizing much of the power thus generated in operating the plant. Norton also used a new type of heat interchanger and fractionating still. Because the power requirements for gas compression are so much less in the Norton plant than in either of the other two, it was thought this system would prove to be the most efficient and would produce helium at the least cost. Such, however, does not appear to be the case; it has been found in the three plants mentioned that the Linde process gave the best results.

In August 1918 the Army and Navy Departments of the United States realized the great importance of having ample supplies of helium for military purposes, and as it had been proved by the experimental plants that its recovery from natural gas was practical on a large scale, it was decided to erect a much larger plant using the Linde process that would have a production of 30,000 to 40,000 cubic feet of helium per day. The construction of this plant was commenced, at Fort Worth, Texas, in October 1918 and it was

completed in December 1920. This plant has produced over 2,000,000 cubic feet of helium of a purity of about 95 per cent. It is the gas from this plant that, together with the small amount made in the experimental plants, was used to inflate the gas bags in the U. S. dirigible ZR-1.

Re-Purification of Gas

After helium has been used in a balloon or dirigible for some time, it becomes contaminated with air by interchange through the fabric of the gas bags, and when the grade of the gas becomes reduced to 85 per cent. its buoyancy is too low to be of practical use and it must be refined. After refining, it can be again used for aeronautic purposes. To provide for this, a re-purification plant has been built at Langley Field, Va., and another is in course of erection at Lakehurst, N. J. The process used in the re-purification of the gas consists of subjecting it to the temperature of liquid air, while under pressure, which condenses any nitrogen and oxygen with which it may be contaminated and allows the helium to pass out of the apparatus at its original purity of 95 per cent.

In addition to these two plants, another, smaller one has been built and mounted on railway cars so that it can be taken to any point in the country on a railway where it may be needed. In this plant the compressed gas to be purified is compressed and passed through cocoanut charcoal at a low temperature. It has been found that this charcoal has the property of absorbing oxygen and hydrogen at low temperatures, but does not absorb helium. It has also been found that the degree of purification obtainable by this method is greater than in the Linde or other processes, it is possible to get a purity of over 99 per cent helium.

Helium Occurs in Nitrogen-Rich Gas

The helium-bearing gas being treated in the United States plants mentioned is obtained from the Petrolia natural gas field, in the northern part of Clay County, Texas and has an average helium content of 0.95 per cent. The wells are not deep and the producing sands are found from 1,550 to 1,750 feet below the surface. They occur at the base of the formations of Permian age, and of the upper Pennsylvanian (Carboniferous) age of the Palaeozoic epoch. The gas from this field is also high in nitrogen content and has a low heating value, as will be seen from the following two analyses:

	No. 1	No. 2
Carbon dioxide	0.0	0.2 percent
Methane	48.4	52.7 "
Ethane	12.8	9.3 "
Nitrogen including Helium	38.6	37.8 "
B.t.u. per cubic foot	755	734

Sample No. 1 came from the Matlock No. 1 well and was analyzed by the U. S. Bureau of Mines, Sample No. 2 was from the No. 1 Beatty well and was analyzed by the Lone Star Gas Co. Both analyses are taken from Professional Paper 121, issued by the Geological Survey of the United States.

In the investigations into the helium-bearing natural gas resources of the United States and Canada, carried out by both Government Departments and by private persons, a great deal of valuable data has been obtained and it has been found that it is only those gases containing an appreciable proportion of nitrogen, and of low heating value, that contain sufficient helium to make its extraction practical on a commercial scale. But it does not always follow that those wells that produce gas consisting almost wholly of nitrogen also contain large percentages of helium, as will be seen from the following analyses taken from publications issued by the Canadian and United States Governments.

Gas Field	Nitrogen content percent	Helium content percent
Morrison, Okla	25.0	0.22
Ponca City, Okla	40.1	0.36
Billings, Okla	42.5	0.39
Loco, Okla	16.2	0.17
Otto, Kansas	57.8	1.04
Dexter, Kansas	82.7	1.84
Augusta, Kansas	88.0	2.00
Sedan, Kansas	55.7	1.94
Fredonia, Kansas	16.4	0.62
New Albany, Kansas	9.8	0.49
Petrolia, Texas	37.4	0.96
Vinton Co., Ohio	15.1	0.43
Vinton Co., Ohio	9.6	0.40
Barnwell, Alberta	6.8	0.36
Bow Island, Alb. (C.P.R. wells)	11.2	0.30
Stony Creek, New Brunswick	12.2	0.06
Selkirk-Dunnville, Ont.	8.3	0.27
Brant-Onondaga, Ont.	11.0	0.30
Blackheath-Seneca, Ont.	8.0	0.32

Geological Occurrence

It has also been found that the richer gases occur only in the upper part of the Pennsylvania (Carboniferous) formation and at relatively shallow depths below the surface. The helium-bearing gas from the Vinton, Ohio, fields comes from the Clinton and Medina sands of the Silurian formation, as does that of the Ontario fields. The helium-bearing gas of Alberta comes from the sands that occur in the Belly river, Niobrara, Benton and Dakota strata of the Cretaceous system. In the United States at Havre, Montana, a well produces gas from the Cretaceous formation containing 0.27 per cent helium; at Minot, North Dakota from the same geological horizon there is some gas containing 0.17 per cent. helium; but in other parts of the country the Cretaceous gas does not contain over 0.09 per cent. and in most cases it is only present as a trace. The gas from the California fields is derived mainly from sands occurring in Tertiary strata and does not contain any helium except in three wells, one in the Coalinga field that showed a content of 0.11 per cent., one in the Santa Maria field that contained 0.13 per cent. and one in the Fillmore field that showed a content of 0.31 per cent. This last was a "dry" gas and came from a sand at a depth of only 600 feet. The gas from the Louisiana fields is derived from strata of the Cretaceous and Tertiary systems, the maximum amount of helium contained in the former being less than 0.08 per cent. and in the latter not more than a trace. In Wyoming one well producing gas from a sand in the Carboniferous formation showed a helium content of 0.26 per cent while those deriving their gas from the Cretaceous strata show only traces or none at all.

From the results of the work done in the United States it may be stated that helium in quantities in excess of 0.5 per cent occurs only in nitrogen-rich natural gas derived from Carboniferous strata at shallow depth, and that when such strata are deeply

the percentage of helium contained in the gas ses. In Ohio, gas derived from the Upper Silu- trata contains around 0.4 per cent and in a cer- ield in the west, gas from strata of the Creta- period contains upto 0.27 per cent helium. In la, however, gases from the Cretaceous contain h as 0.36 per cent helium, and it is to this gas ve must look for a supply of that very valuable nt, particularly in view of the fact that this is ly source so far discovered within the Empire.

Canada's Helium Supply

a very interesting paper read before the Ameri- nstitute of Mining and Metallurgical Engineers ir recent meeting in Montreal, Dr. R. B. Moore the following statement: "As this country (the d States) has the only large source of natural ontaining helium in the world, it is of great im- nce, from the national defence standpoint, that nonopoly be retained; therefore, the exportation elium is inadvisable. The matter should be led without great difficulty as there are no com- ial plants in operation at the present time and, fore, the control of helium does not interfere capital already invested." In this statement Dr. e refers to gas containing 0.5 per cent. and over elium, because he states that gas containing less that amount is not considered of commercial e.

hile we do not possess within the Empire, so far known, at present, any sources of helium-bear- natural gas as rich as some in the United States, have large volumes containing between 0.30 and per cent and it is quite practicable to separate bring it up to a purity of 99 per cent, and to store steel cylinders against the time when it may be led for aeronautic purposes in defence of the coun- or for commerce. There is no question but that um from the rich gases in the United States can be duced much more cheaply per thousand cubic feet from the lower grade Canadian gases; but cost is everything when it comes to defeating the enemy. re is absolutely no question that the country com- ding adequate supplies of helium in the next war have an advantage that cannot be estimated in ney, and it might easily make all the difference ween victory and defeat. If the Germans had been e to fill their Zeppelins with helium instead of with drogen during the recent war, there would have n a very different tale to tell.

Canadian Helium Now Being Wasted

The United States is so fully alive to this that there s been introduced a bill in Congress looking to the nservation, production and exploitation of helium f national defence and for the development of com- rcial aeronautics, and they have built a plant which producing helium on a fairly large scale, — the ly plant of its kind in existence. The Canadian overnment also realizes the importance of this mat- r, as is proved by their reserving to the Crown all lium contained in natural gas and the right to ex- act the same; but so far no effort is being made to t the reservation and right into effect, and every y the store of helium is growing less and less by me 20,000 cubic feet, which is the quantity con- ined in the natural gas consumed daily in western nada.

Those of the Journal's readers who are interested the scientific side of this most interesting element, helium, will enjoy reading Professional Paper 121, issued by the Department of the Interior of the United States, entitled "Helium-Bearing Natural Gas," written by the late G. Sherburne Rogers, and Bulletin No. 31, of the Mines Branch, Ottawa, on "Some Sources of Helium in the British Empire," by Dr. J. C. McLennan and associates.

PERSONAL AND GENERAL

Mr. Sherwin F. Kelly, who is the exponent on this continent of the Schlumberger method of electrical prospecting, is now an assistant on the staff of the department of geology of Toronto University. Last summer he conducted electrical surveys of some deposits in the gold belt of northwestern Quebec, whose further examination by diamond-drilling should give some very interesting comparative data.

Mr. L. H. Cole has returned to Ottawa after a fruitful season spent in investigating the alkali deposits of Saskatchewan on behalf of the Mines Branch. He has a comprehensive report on this subject in course of preparation.

Mr. Howells Fréchette, chief of the ceramics division of the Mines Branch, Ottawa, is on a tour of the west with a view primarily to completing the store of materials for the Canadian ceramic exhibit at the British Empire Exhibition.

Mr. J. J. Warren, president of Consolidated M. & S. Co., has returned to Trail for a few weeks.

Directors of Dome Mines paid a visit to their mine in Porcupine last week.

Mr. R. B. Watson, general manager of Nipissing, is in Toronto General Hospital, where he is recovering from a threatened attack of pneumonia.

Mr. Harrison; E. Clement, Manager of the Crystal Copper Company of Butte, Montana, has been appointed general manager of the Premier Paymaster Mine and the United Mineral Lands Companies in Porcupine. The resident manager will be Mr. W. G. Norrie-Lowenthal, of British Columbia.

Mr. Hamilton B. Wills is understood to be making a satisfactory recovery from a cerebral hemorrhage, from which he suffered a short time ago.

Mr. R. A. Bryce, of Toronto, has returned from a few days' trip to New York.

CENTRIFUGAL CONCENTRATION

In connection with experimental work performed some time ago at the Reno, Nevada, station of the United States Bureau of Mines, on the concentration of a zinc descloizite ore carrying vanadium a laboratory size centrifugal concentrating bowl was developed for extracting metals from the slimes that represented the major portion of losses in the table concentration of the descloizite ore. More recent experiments indicate that the bureau's concentrator may have a commercial application to a neglected field of metallurgy, the concentration of slimes that are not amenable to flotation, or that it may possibly compete with flotation itself in the treatment of some ores. Improvements evolved have been incorporated in a design for a small commercial machine with which further [illegible] may be conducted under plant conditions.

YUKON WIRELESS STATIONS

The Gold Commissioner of Yukon Territory has reported officially that the new radio stations at Dawson and Mayo are working spendidly. These two stations constitute the first link in the projected Dawson Edmonton wireless system

An Iron and Steel Industry for British Columbia

Supplementary Report by Victoria Chamber of Commerce

A special committee was appointed recently by the Victoria Chamber of Commerce to investigate the proposals of Coast Range Steel Ltd., for the establishment of an iron and steel industry in British Columbia. The first report of this committee already has been published. (C. M. J.—October 5th, 1923). It was a condemnation of the suggestion that the provincial government should guarantee the bonds of the corporation up to $4,000,000. The committee now has issued a supplementary report, which has been considered necessary because of a subsequent interview with Mr. H. J. Landahl, the promoter of Coast Range Steel, Ltd. The conclusions, reached in the first instance, however, have not been altered. They are as decisive, perhaps more so, as those set out in the original document. The last report is brief and to the point. It follows in full:

"Your committee desire to supplement their original report on the Coast Range Steel Company in view of the interview we have since had with Mr. Landahl and his associates.

"We find that whilst the original financial structure was as indicated, it has since been changed in the following manner:

"The proposed cost of the industry is to be twelve million dollars, the entire funds for which are to be provided by bond issue up to 100% of its cost. Four million dollars of this is to be provided by the Provincial Government, four million by the British Department of Industries, and four million by the British Iron Masters, whose status we understand is that of suppliers of the machinery and equipment for the plant, conditional upon the machinery and equipment being purchased in Great Britain. In addition it is proposed to issue a further sum of three million dollars worth of debentures, over and above the twelve million dollars subscribed for by the respective governments as mentioned above.

"The Coast Range Steel Company is capitalized for fifteen million dollars of common stock, which Mr. Landahl states he is prepared to put in the hands of the Provincial Government. Under ordinary conditions this stock would, of course, control the operation of the company, but, in view of the fact that the Provincial and Imperial authorities would be providing all the funds proposed to be expended, this common stock has no value and should in no way control the operation of the company.

"In the case of failure, the property would pass into the hands of the bond holders, and our Provincial Government would hold a minority interest only. There would be nothing to prevent the majority bond holders in Great Britain disposing of this plant in such a case under conditions disastrous to this Province, unless our Provincial Government were prepared to purchase a large portion of the bonds held by the majority holders.

"We submit that, however, faulty and ill-advised in the interests of this province the financial structure may be, it is entirely subsidiary to the major factor of raw materials, cost of production and market available.

"From all the facts we can gather from estimates as to a suitable coke and the cost of it on the Coast, their estimate is more than wide of the mark. They estimate that the composite price of iron and steel was only $41.77 against a recent composite Pittsburg price of $60.60 per ton, or approximately $90.00 laid down in British Columbia. Again, they estimate the total value of iron and s imports into British Columbia to be $8,136,445, of w 90% is from the United States and includes such it as machinery, vehicles (including automobiles) etc., of which total we find only $3,441,136 comprising ma ials which a complete iron and steel plant could prod

"Mr. Landhahl states that there is 337 tons of pig brought into the Coast per day. It is not clearly defi to what territory this tonnage is distributed; but we po out that the official Government figures show that th was imported into British Columbia, during the fiscal y ending March 31, 1923, a total of 2,000 tons of pig i or an average of less than seven tons per day. Mr. Lan ahl's tonnage of 649 tons of iron and steel brought i this Province from foreign countries is, apparently, a rived at by taking the low composite price of $41 (which we have already shown to be less than half t actual composite ton price laid down in British Columbi and dividing it into the entire imports of $8,136,445 f the year ending March 31, 1923, which total sum includ many high-priced articles such as farm implements a machinery, firearms, hardware, general machine stamped and coated products, tools, vehicles (includi automobiles), etc., none of which could be expected to b manufactured by the plant Mr. Landahl has in conten plation.

"We should not, however, lose sight of the fact that, pig iron and steel billets were produced in British Colum bia at a low enough price, the demand for these produc would rapidly increase both within the Province and ou side. We do not agree with Mr. Landahl's statement tha they had to have Provincial Government backing to pro tect themselves against the dumping into this country b foreign competitors, because, in our opinion, the ant dumping regulations are sufficient protection.

"In view of the inaccuracies as to the general condition surrounding the industry as placed before us by Mr Landahl, and, having carefully reviewed the whole sub ject, this committee feels that they cannot change their attitude towards Mr. Landahl's proposal, as shown in the report already presented to you.

"Generally we find ourselves opposed to the commit ment of the Province to a scheme of this magnitude, be lieving that to attempt to commence this industry on such a scale as to immediately challenge ruthless competition from established iron centres, would be unwise and court ing disaster. We have already stated our view that this industry should be commenced on a moderate scale from an experimental standpoint, either as a governmental work or by private enterprise assisted by a bonus, in order to demonstrate beyond peradventure the practicability of the industry at this time.

"All of which is respectfully submitted: F. A. Pauline Chairman; C. P. Hill, R. R. Nield, C. P. W. Schwengers M. P. Plair, Captain Matheson, M. B. Jackson, J. Hinch cliffe, J. B. Clearihue, G. B. Mitchell, E. Tomlin

In view of the position taken by the committee, it would appear to be proper that the comments made by Mr. F. A. Pauline, M. P. P., chairman, in submitting the report on behalf of his fellow investigators should be given. He said:

"It is not a pleasant duty to report unfavorably on a proposal such as Mr. Lanahl's, particularly at this time, when we were all keen to see a greater industrial development. We believe in the iron resources of the Province,

l are confident that they are destined to be an impor-
t factor in our industrial life in the near future. But
regard it as essential that the initiation of this great
ic industry, whether assisted by the Government or
, shall be projected upon such prudent and scientific
es as will give the industry a fair chance for success
m the beginning."

NING IN NORTHERN ONTARIO AND QUEBEC

Under the above caption, the Royal Bank of nada discusses the mining industry in its new letter November 1st. as follows:

Judging from the highly gratifying reports which ıbody the findings of recent geological investiga-ın and from current expansion of mineral output, e mining industry, and principally that of Northern ıtario and possibly Quebec, is rapidly assuming a ore important place in our economic development. ıring the past generation, the output of Canadian ines has risen in value from about $10,000,000 to proximately $220,000,00 having doubled during e last decade alone. In the first six months of this ar, the total mineral production of the Dominion nounted to $87,152,248 in comparison with $60,361,-)9 for the same period last year — an increase of per cent. It is to be noted that Northern Ontario ayed an important role in this increase, the output nickel and copper having expanded materially.

It is, however, in the mining of gold and silver that ıe most notable expansion has taken place. In the ıse of gold the power shortage somewhat handi-ıpped the industry, and it was not until recently that hough power was obtained to provide for capaci-operations of the Porcupine mines. As it as, however, the production during the first six ıonths of the year, almost equalled the high record et during the same period of 1922. Fortunately, ıe power problem has been solved. New equipment as been added and with new producers entering the ield, the year's output will probably exceed the high ield of 1922. During the first six months of the ear, Ontario produced 78% of the entire Canadian utput of gold. Activities during that period in the Porcupine and Kirkland Lake areas were very pro-ounced and production records were steadily increa-ed. The more investigation that is made in this area y responsible authorities, the more optimistic are the eports. Apparently the ore bodies in these fields xtend to very great depth. Across the Quebec bor-ler, certain of the important veins are being inves-igated and it is estimated that gold may extend con-iderably farther east than is now known. The pro-luction of silver also is reviving very noticeably in he northern districts. The South Lorrain tract is he scene of very great activity and continues to con-ribute large amounts to the total output of silver. It is now an established fact that the area surround-ng the lower end of Hudson's Bay and extending even beyond the lakes, known as the pre-Cambrian or Laurentian shield, offers tremendous possibilities for expansion. As yet this area has been exploited only in a very small way.

The facts and figures cited above have two impor-tant implications. They emphasize, in the first place, the tremenous future possibilities of the mining in dustry of Northern Ontario and Quebec from a purely industrial standpoint, and they indicate, secondly, that this industrial development may have a very impor-tant bearing upon the growth and solidarity of the Dominion. Economic progress has been retarded in Canada by virtue of the expansive and largely unex-ploited gap which stretches south of Hudson's Bay for some distance and east and west for a much great-er distance, and which makes a distinct cleavage be-ween eastern and western Canada. This area has presented very serious problems in transportation and in the distribution of goods, and its gradual utilization and settlement may easily have far-reaching signif icance in future development of the country.

RECONSTRUCTION AT LENS

The progress of reconstruction in the mines of Lens, France, is a subject that will interest many Canadian mining men. Last spring, M. Cuvelette, general manager of the Mines de Lens, delivered an address before a conference in Paris that gives a vivid picture of the destruction and the progress of restoration.

It is well known that, even before bombardment reduced the surface equipment of the mines and coke ovens to piles of debris, the Germans had systematically removed what machinery they wanted and had destroyed the remainder.

Subsequent examination has showed the pains they took in flooding the mines. They brought engineers from the Ruhr mines, where the formations are the same, and under their direction the shaft linings were breached with dynamite at points where water-bearing strata were known to exist.

The inflow of water to the damaged shafts through these water-bearing strata was stopped with cement. Nine or ten holes were drilled in a circle at a distance of 40 feet from the centre of the shaft down to these strata. Cement grout was then pumped down, which spread into the crevices, as much as twelve to fifteen tons being thus placed from one bore-hole. This was repeated with an inner circle of holes with a radius of about 30 feet. In some cases this sealed the strata completely, and in others it obstructed the flow of water sufficiently to allow the huge electric pumps to overcome it. This cementing is not effective in sand, clay or chalk, but the flow of water from these strata has been more than matched in some cases by the powerful pumps.

Cementing, clearing away of debris and other preliminaries consumed about two years after the armistice. Since November 1920 most of the pits have been cleared of water, fourteen of them being cemented. But this is only part of the work of reconstruction. Of the 8,000 houses owned by the company, only 33 could be repaired. Now there are 6,000 new dwellings. Some of the coke ovens have been rebuilt, as well as others of the plants essential to a great colliery district. This one company has 23 hoisting shafts and 12 ventilating shafts. The[illegible] clear of water, but the underground workings will not be completely cleared until the end of this year.

REFRACTORIES FOR STEEL MAKING

A survey of operating conditions [illegible] hearth steel practice will be made [illegible] periment station of the United States [illegible] Columbus, Ohio, for the purpose of determining [illegible] in available commercial refractories fall short of giving ideal service. The Bureau of Mines plans later, in co-operation with the steel industry, to undertake the development of ideal refractories for specific services.

Don't be afraid of being too kind. In this world one must be a little too kind to be kind enough.

Geology and Ore Deposits of Rice Lake, Manitoba

Abstracted from a Report by J. F. Wright, Geological Survey of Canada

The following is abstracted from a report by J. F. Wright in *Summary Report,* 1922, *Part C.* of the Geological Survey. The report is accompanied by a preliminary map on a scale of a mile to the inch.

Most of the field season of 1922 was spent in detailed geological mapping of Rice Lake map-area, in southeastern Manitoba. The map-area is part of a mineralized belt of country about 15 miles wide that extends northwestward from about mileage 90 on the Manitoba-Ontario boundary to lake Winnipeg, a distance of about 60 miles. Quartz veins that contain free gold have been known in this belt for a number of years. The Gabrielle claim north of Rice lake was the first claim in this district, and was staked in March, 1911. Since then about twenty-five hundred claims have been staked and up to the end of 1922 over two hundred claims were surveyed. A general reconnaissance survey of the whole mineralized belt was made by the Geological Survey in 1912, and detailed studies of small areas were made in 1916, 1917, and 1921. The field work here described was undertaken to ascertain more definitely the origin and geological relationships of the mineral deposits in this map-area and to provide prospectors with a fairly detailed map showing the distribution of the various rock formations, especially the areas most favourable for prospecting.

Rocks of the Area

As far as known the oldest rocks are a thick series of lavas, ranging from basic to acidic in composition, a part of which was probably extended on land and a part under water. Interbedded with these lavas are thin beds of clastic sediments.

Apparently conformably above the acid lavas is a series of schists and gneisses, a large part of which is probably of sedimentary origin.

These lavas and sediments nearly everywhere stand vertically or at high angles.

East of Rice lake there is a thick series of clastic sediments, which in every noted case strikes about east and west and dips from 30 to 60 degrees to the north. The relation of this series to either the lavas or probable sediments is not known, and it is probable that in the Rice Lake map-area this series is faulted into its present position and its true stratigraphic relations are not revealed, although one outcrop near the east end of Rice lake shows this sedimentary series to be conformably overlain by rhyolite and basalt described under the volcanic group.

A granitic intrusive, porphyry, and diabase dykes cut all three of the above groups of rocks.

Gold Quartz Deposits

Gold deposits are the only known deposits of possible economic value in Rice Lake mining district, though nickel-copper deposits occur, not far to the south, at Oiseau and Maskwa rivers. Gold claims have been staked since 1912, and each year some development work and prospecting are done, but up to the present only a few thousand dollars worth of bullion has been produced, though hundreds of thousands of dollars have been spent. In most cases the development work has not been systematic. Only shallow shafts have been sunk on a great many claims, so that there is little or no information about the extent and character underground of any of the deposits. The Selkirk Gold Mining Company, Inc., is making a systematic attempt to explore the deposits on the Luleo group of claims underground and the results are fairly encouraging. However, a number of the gold-bearing deposits are known to be large enough to encourage further development, if their average values were not so disappointingly small.

The gold quartz deposits outcrop as a series of lenses which partly replace the country rock and fill fracture planes in the volcanic and interbedded sedimentary group and in the granitic intrusives. These fracture or shear zones as already described, are characterized by frequent pinches and swells along their entire length and are only partly replaced with quartz, various sulphides, and gold. The quartz and sulphides in some places display a banded or ribbon structure. In general character and mineralogy these deposits resemble gold quartz deposits formed under conditions of intermediate depth and temperature.

All the known deposits of the area have many features in common, and they will, therefore, be described in groups named after lakes or important mineral claims. De Lury used this system and has given much information concerning the various prospects. The following descriptions necessarily repeat many of the facts stated by De Lury, but all the information available since 1920 is added. No attempt is made to describe in detail the quartz leads on each claim, but rather to describe the important known deposits and general character of the whole group. The claims north of Wanipigow lake and river will be described first because developing and prospecting were active during the summer of 1922.

Luleo Group

This group is in the northwest corner of township 2[illegible] about 6 miles west of Wanipigow lake and 1 1-2 miles north of Wanipigow river. The group covers about [illegible] square miles and includes thirty-five surveyed claims. The outcropping rocks are massive granite porphyry and granodiorite cut by diabase dykes, and contain many schist inclusions. The outcrops occur as low ridges and islands in the spruce swamps and muskegs which are abundant.

Prospectors have sunk many shallow pits along the shears and fractures on the various claims of this group. The Selkirk Gold Mining Company, Inc., have, at the Selkirk mine, sunk 325 feet near the footwall of the main shear of the Luleo No. 2 mineral claim, L. 42--174. At the 125-foot level a crosscut was driven 50 feet to the north, 17 feet in granodiorite and 33 feet in sheared granodiorite and vein quartz. From where this crosscut intersects the footwall of the shear zone a drift was run along the vein 225 feet east and 250 feet west. At 125 feet east the vein was 62 feet wide, but was mineralized only 4 or 5 feet from the footwall. At 200 feet east the vein was almost entirely replaced by schist impregnated with quartz. At the east end of the drift there is very little quartz, but the granitic rocks are badly schisted. Along the west drift the quartz ends where a quartz-mica schist inclusion was encountered. Along the crosscut from the 325-foot level the fracture or shear zone is about 5 feed wide and contains little or no quartz, but along the east drift the sheared zone widens, and quartz is fairly abundant. The above description illustrates the irregular character both of the fracture zones and of the quartz.

In the workings of the Selkirk mine, described above, quartz is the principal gangue mineral and occurs as lenses of either a white, sugary, or a dark, glassy variety. Some of the quartz along the Selkirk mine workings contains no

sulphides, but in a considerable part small grains of pyrite are distributed. In some parts of the vein, especially along the footwall, pyrite is abundant, and associated with it are small amounts of chalcopyrite, arsenopyrite, sphalerite, and galena. The quartz, pyrite, arsenopyrite, and chalcopyrite were evidently deposited contemporaneously, and later were badly fractured, for they are now veined with white mica, calcite, ankerite, quartz, and specks of gold. The granulated sulphides and quartz recrystallized, and in some polished surfaces quartz appears to replace pyrite and in others pyrite replaces quartz. Assays of sulphides with little quartz are reported to run from $150 to $200 a ton. The gold must be finely intergrown with the sulphide because no gold was seen in polished sections. However, specks of gold were noted in the vein material which cuts the sulphide, especially the arsenopyrite. This gold was probably liberated from the sulphide during crushing. Free gold also occurs throughout the white quartz or as thin films along cracks in this quartz. Molybdenite and mariposite (green chrome mica) were noted at one place along the workings. No tourmaline, pyrrhotite, specularite, or other high temperature minerals were noted in this mine or in any of the veins in the map-area. The mineralogy of the gold quartz veins of the Rice Lake mining district is similar to that of Kirkland Lake gold area, Ontario.

Last year the Selkirk Gold Mining Company, Inc., blocked out a considerable tonnage of ore said to assay from $10 to $15 a ton. Beyond this there is little information about the tonnage and value of the ore in any of the claims of this group.

Gold Lake Group

This group of mineral claims is near the centre of the western part of township 23, and includes the claims between Gold and Big Clearwater lakes. Of all the prospects in the Rice Lake map-area the Gold Pan is the best known, and has furnished very rich specimens.

The Gold Seal, Gold Pan, and Gold Pan Extension workings are along the same fracture zone. This zone strikes north 30 degrees west and was traced fairly continuously for 2,500 feet. It varies greatly in width, averaging possibly 2 1-2 feet for this distance. The quartz is very irregularly distributed, varying from 1 inch to 2 or 3 feet in width but averaging less than 1 foot. On the Gold Pan about 725 feet of underground work was done at various intervals between 1916 and 1920. The shaft was sunk where the fracture zone crossed the diabase dyke, and all the rich specimens were found along the western face of the dyke. The open spaces resulting from the fracturing of the competent and brittle diabase evidently made favourable conditions for the concentration and deposition of the gold quartz solutions. In September the Gold Pan workings were pumped out preliminary to stoping the remainder of the rich ore between the 100 and 200-foot levels. Several hundred feet of underground development has been done on the Gold Pan Extension and Gold Seal and the results, combined with the results of the Gold Pan work, show that these deposits underground are very similar in shape and mineral content to their surface outcrops.

To the southwest of the Gold Pan zone a well-developed and continuous shear zone crosses the Pilot, Smuggler, and Canadian Girl claims. The sheared zone is in places over 30 feet wide, but along the strike to the southeast the quartz is not so abundant, which is the reverse of conditions along the Moose shear zone. However, from surface showings this gold quartz deposit is the largest known in Rice Lake map-area and seems to warrant further development combined with systematic sampling and assaying to prove the value of the ore.

Summary

Enough work has been done in Rice Lake map-area to prove that there are large tonnages of minable quartz along a few of the sheared zones, but the average value is too low to make these deposits of economic value under present conditions. Stripping on a large number of mineral claims proves that other quartz veins exposed are too small and irregular in shape to be worked economically, even though they be exceptionally rich. A very noticeable feature about deposits in the granitic intrusives is a marked concentration of high-grade gold ore around the ends of inclusions along the shear zones; as these inclusions evidently controlled the location and continuity of some of the shears in the granitic rocks, future mining will probably prove that the size of such deposits is largely controlled by the size of the inclusion. Underground development indicates that in some cases the outcrops give a fair indication of extent and values in depth. Since the outcrops of the sheared zones are lens-shaped, and the gold-bearing quartz in the shears is very irregular in shape and distribution, a great deal of expensive exploratory work, combined with systematic assaying, must be done to prove the shape, size, and value of each property.

PROSPECTING DE LUXE!

The *Canadian Mining Journal* learned some weeks ago of an unmitigated hoax perpetrated upon strangers in the name of prospecting. It has therefore asked a correspondent to whom all the facts are known to state the case briefly, with a view to preventing its recurrence. This correspondent says:

The London *Times* of March 13th last had the following personal on the front page: "Explorer and Geologist invites Gentleman to complete pioneer ex- "pedition, Northern Ontario (Goldfields); three "others; great opportunity right man; sailing April; "£300 capital and good health essential; highest cre- "dentials. Write Box Y 482, The Times, E.C. 4."

The reply to this put Mr. Dudley Hunt, ex-naval officer, ambitious to make his way in the world, in personal communication with one Horace Laycock, who in 1909 was a solicitor's clerk in Elk Lake during the time of the silver rush into that district. Laycock explained to the enquirer that his brother William Laycock was the explorer and geologist in question and that he, Horace, was acting on his distinguished brother's behalf, enumerating the following points:

First. — William has had four year's personal experience of the territory.

Secondly. — William is a mine owner in Northern Ontario.

Thirdly. — William has obtained information from "official" sources as to the country it is proposed to prospect.

Fourthly. — William made a rapid journey through the district just before winter set in to verify information.

Fifthly. — William thinks so well of it that he is going to suspend his other important interests for six months to get in first.

Sixthly. — William is a wonderful "bushman" and knows the country probably better than anyone else and wants only real "he" men in the party.

The expedition gathered at Elk Lake on May 5th last. In addition to the Explorer, Mine Owner, Geologist, and Mining Engineer, William Arthur Laycock,

three others were in the party; two young Hollanders named Prinz and Van Hien and our friend Dudley Hunt. All were strongly impressed by the "leader" to keep secret the destination of the expedition, as some of the keen prospectors might track them. The residence of the eminent Geologist, Mine Owner, Explorer and Mining Engineer, at Elk Lake, was a two-roomed shack with a lean-to kitchen rather sparsely furnished; but, of course, explorers are obliged to put up with all kinds of hardships.

The expedition, after ten days' delay, started up the Montreal River, and on the second day camped in the wilds at Moyneur's restaurant, later safely reaching Steve Lafricain's outpost, and found the Indians peaceably disposed. The party went into camp around High Falls and the explorer tried to find Powell Creek, but failed, and the expedition prepared to send out scouting parties. By the end of the month a bush fire approached the camp and Billy Shields, a well-known prospector, warned the party; but when the fire came they had just time to cut the tent ropes, jump into the canoes with their personal baggage and depart, the camp and supplies being lost. The party followed Shields to High Falls and got out of the path of the fire.

The lost supplies were replaced by the end of the first week in June and the party loitered around the canoe route in Powell and Argyle, not doing much of anything and looking to the leader to make good. According to the members of the expedition the leader seemed lost and did not get anywhere without first going to find the route, and at last about the middle of the month of June the three, who had already put up $700.00 apiece (first half of the premium), held a council-of-war and insisted that Laycock take them to where he had panned gold in his rush trip the fall before. This locality never turned up, but later the party staked claims on an outcrop of "bull quartz" in Argyle. On the 18th June, the camp got on fire again but most of the stuff was saved.

By this time Prinz was completely "fed up" with the affair and went to Toronto where he consulted a firm of solicitors, who advised him not to pay over any more money and to claim back what he had paid.

The others were inclined to follow Prinz' example, but after considerable acrimonious discussion, and Laycock's promise of improvement in the conduct of affairs, and some persuasion by Laycock's solicitor, those remaining made a new deal and the second payment of $700 each was made by Hunt and Van Hien in Cobalt.

While the expedition was out at Cobalt and other places, they had cached the major part of their supplies, clothing, blankets, cured meats, etc., under the direction of the Explorer, in a pit they dug on an island. A party of fire rangers happened to land on the island to make camp and finally found the cache by the smell, the pit having filled with water and spoiled everything spoilable. The fire rangers hung up the blankets and clothing, but they were almost past redemption.

After the second payment was made by Hunt and Van Hien, the expedition made another start from Elk Lake, but the Leader developed sickness and complained of pains, etc., and Hunt went back to Elk Lake with him and the expedition was left without its Guide, Leader, Geologist, etc., till the middle of July.

During all this time there had been a gold rush into McNeil township, but Laycock had refused to go there although it was only four or five miles from the Thesaurus Mine on the North Bend of the Montreal River, and the next township to Argyle where the party had been loitering for weeks doing nothing useful.

Later Van Hien arranged to leave the party for a few days and go up to Jim Nelson's (Thesaurus Mine) and while there one of the prospectors named Jim Byrnes took him in to McNeil and helped him to stake a claim in the gold formation there, which may be of value.

Van Hien, when he rejoined his party, urged the importance of getting into McNeil at once, but it was a week later before the expedition went into that neighborhood, and then they did not go near where the gold discoveries were, but staked some swampy ground on the N. E. corner of Argyle township. Finally, disgusted with the way things were being done, Hunt and Van Hien notified the Leader that they were through and asked for an accounting and finally issued writs.

The statements of claim aver that the defendant Laycock "entirely misrepresented his qualifications "and obtained the sums of money hereinbefore men-"tioned from the Plaintiffs upon representations "which were, in fact, untrue. The defendant re-"presented himself as a 'mine-owner' and 'explorer' "'geologist' and 'mining engineer', whereas it be-"came apparent during the operations of the expedi-"tion that the Defendant was not capable of finding "his way in the country to be traversed, was not a "geologist or mining engineer, and had no practical "nowledge of prospecting and spent the time of the "expedition in loitering along well-known water-"ways, and the expedition's time was wasted on ab-"solutely worthless country."

The plaintiffs claim re-payment of the money paid by them to the defendant and for damages, and in the alternative that all accounting he had as between the parties, etc.

Since the issue of the writ the defendant has sold off what household goods he had in Elk Lake and has gone to Toronto.

There is a great deal of sympathy around Elk Lake for the young men who have had their money taken from them in this way. They seem decent chaps, and had they come to Elk Lake, any of the prospectors would have been pleased to give them a start at prospecting without asking any premium.

MAP OF CHU CHUA

The Geological Survey, Ottawa, has published Map 1997, which shows the topography, with 100-foot contour interval, of the Chu Chua creek area on a scale of a mile to the inch. The area mapped is sixteen miles in length, along the North Thompson river, fifty miles north of Kamloops, B. C.

Samson had the right idea about advertising. He took two columns and brought down the house.

If you want to be "free from the body," make it healthy. As Rousseau said, "The weaker the body is the more it commands."

The Recommendations of the United States Coal Commission *

By GEO. OTIS. SMITH
Director, United States Geological Survey

The United States Coal Commission's contract expired September 22 with no legal provision for renewal. But the job is not finished. In the 11 months and 4 days of the Commission's official life an immense mass of information was quickly collected and voluminous reports were hurriedly written. With adequate time available, say at least two full years, its field of investigation might have been more narrowly circumscribed, its lines of inquiry more wisely chosen, the facts it found better selected and arranged, its reports far less voluminous, and its recommendations more definite. It is none too generous praise to term the Commission's reports, made public as yet only in a form primarily for the use of the press, a veritable mine of valuable information, but candor compels the added comment that to prepare the product of this mine for general consumption, some sort of a breaker must be provided — it is not enough to dig up raw, crude facts; they must be sized and separated from associated matter of less value.

Only in part are the recommendations contained in the Coal Commission's twenty-odd reports broadly or analytically stated; hence the reasonableness of a frequent criticism of the Commission and its work. Plainly the Coal Commission needs an interpreter, yet no individual, however close he may have been to the now defunct Commission, can claim any exclusive warrant as authoritative interpreter; the field of constructive criticism, to seek "a wise and efficient policy" for the coal industry, is open to all. Indeed, it is proper to regard the published results of the Commission simply as a starting point. Fortunately, wisdom did not die with the Coal Commission; and we may begin where it left off.

The Commission's Principal Finding

The basic finding of the Commission was its statement of the economic fact that the mining of coal is a business clothed with a public interest, and this but repeats the underlying thought of Congress in providing for fact-finding as a preliminary to legislation. An unfailing supply of domestic and industrial fuel is vital to the general welfare; this means an uninterrupted service in mining and transporting coal, a service that to be efficient and effective must be continuous; and this country-wide dependence upon coal is the compelling reason for some degree of public control of what many citizens prefer to consider a purely private business. If, however, the economic fact that coal mining is an indispensable service can be justly disputed or the legal right of the public to protect the home, nation-wide industry, and interstate commerce can be reasonably denied, it is idle to seek to make a national issue of coal; this Academy and the Congress of the United States might as well devote their thought to the economic and political aspects of asparagus growing, shoemaking, lace manufacture, or any other private business. The Commission finds that coal is vital to America every day and hour.

The first recommendation of the Commission is to let in the light upon the coal business — "the public needs information and the industry needs publicity." Continuous Governmental supervision to find the facts and, in the light of full and up-to-date information, as much governmental regulation as is required to stabilize the industry and protect the public seems to have been the guiding thought of the Commission, with somewhat of a preference, repeatedly expressed but perhaps never sufficiently outspoken, for a minimum of public regulation. Self determination is set up as the ideal for the industry, self determination stimulated by an active and well-informed public opinion.

No Cure-All Available

The year and more in which the coal problem has been given the center of the stage has not sufficed to bring to it the full understanding that is desirable and indeed essential. The continued play of the spotlight has brought out many details but all the fact-finding has not discovered any simple cure-all. This explains the absence of a clean-cut program as the final pronouncement of the Coal Commission; instead, the Commission addresses recommendations of remedial action not only to the Congress but to State legislatures and municipal officials; to the Interstate Commerce Commission and to railroad executives; to coal operators and to mine workers; and finally to the great body of coal consumers, large and small. The finding is one of divided responsibility for things as they are and therefore of distributed obligation to make things different.

The Commission recommended that the Interstate Commerce Commission be made the administrative agency for continuing fact-finding and exercising whatever regulative function is demanded to correct abuses. This recommendation expressed not only a preference for an agency with established policy and prestige rather than a new and untried bureau, but especially the conviction that the intimate relation between transportation regulation and the coal business furnished the logical if not the only basis for the exercise of regulatory powers by the Federal Government.

Over-Development of Bituminous Fields

With adequate supply and reasonable prices as the ends in view, the Commission sought to analyze the workings of the law of supply and demand. The undercapacity of the anthracite mines [illegible] anything but ordinary demand is in marked contrast with the over-development of the bituminous mines, whose capacity far exceeds even the peak demand. In the anthracite industry restraint of trade is unnecessary, for the overdemand maintains price levels; in the bituminous industry no combination or monopoly of producers has ever controlled either supply or prices. With both hard and soft coal, then, the immediate cause of exorbitant prices has been the demand from buyers at times when the supply has been inadequate. The consumer himself can do much, as the Commission recommends, to smooth out the ups and downs of demand, by purchasing coal on annual contract and

* An address presented to the annual meeting of The Academy of Political Science in the City of New York on Tuesday, November 20, 1923.

by providing for storage. To encourage the off-season delivery and storage of bituminous coal, the Coal Commission recommends that the Interstate Commerce Commission allow the commercial ability to sell coal the year round to be the controlling influence in the distribution of railroad cars in months of transportation shortage. Economy in the use of transportation by the encouragement of river movement of coal and by the discouragement of log rail hauls is also recommend. Unfair competition by means of unwarranted freight differentials has favored waste of transportation service, both in making improved waterways ineffective and in promoting the premature opening of mines to serve old markets already well supplied from nearer fields. Thus, mine capacity has outstripped railroad capacity.

Irregularity of seasonal demand and unnatural widening of marketing territory, however, are not the only causes of overdevelopment. The opening of too many mines has been a direct result of the uncertainty of continuous operation due to the uncertainty of labor supply. The periodic and anticipated strikes encouraged a higher peak capacity within the organized territory, and as the strikes increased in severity the coal shortages promoted the opening of more mines in the nonunion fields. Its full monopoly of mine labor in the anthracite region as well as for the larger part of the bituminous tonnage brings the mine workers' union into the foreground of the picture.

The Commission's unequivocal declaration of belief that the union has been potent in bettering the workers' condition but that it can win public approval only as it in turn "accepts in practice the principle that the public interest is superior to that of any monopolistic group, whether employers or employees," might have been condensed into the blunt statement that the union is needed to protect the miner, and the nonunion fields are equally needed to protect the public. But this competition by the nonunion fields, while affording the consumer a large measure of protection as to both price and supply, has cost dearly in other ways, especially in promoting overdevelopment and all the evil consequences that flow from it: too many mines and miners, too short and too uncertain working time, and rates of wages and profits that express to some degree these hazards of employment of both labor and capital. The removal of causes of overdevelopment, therefore, was the subject of several recommendations by the Commission.

These and other recommendations of the Commission relating to taxes, licenses, freight rates, car distribution, inspection of coal, consolidation of mining companies, safety codes, improvement of underground management, larger use of machinery, betterment of living conditions, attention to personnel management, study of the wage structure, and continuous investigation and publicity are all well supported by its findings of fact, * yet each and all of these reforms will fail to stabilize the industry and better the conditions for all concerned if periodic suspensions of mining are to continue. The real issue concerns the sovereignty of the American people in their relation to those who own coal mines or work in coal mines: is the people's right to an uninterrupted supply of coal the dominant right?

Militant Spirit of Miners' Unions

The people's right to a supply of coal at reasonable prices should be equally enforceable against a combination of operators raising the price or a combination of miners shutting down the mines. We have already outlawed combinations of capital attempting restraint of trade or even control of price; a country-wide combination of labor with the declared purpose of enforcing its own decrees by creating public distress would seem even less justified. When its half-million or so members — a sixth of whom do not care to be American citizens — direct their united efforts against the whole people the militant spirit of the mine workers' union takes on the ugly aspect of civil revolt. The open threat of tying up the commerce of a nation and shutting down its industries, the menace of economic chaos, is neither a just nor a legal method of obtaining higher wages for one class of workers in half a dozen States, for surely, the economic rights of the whole body of American workmen are greater than the rights of a small fraction of that body. The mine workers' method of giving a trouncing to their employers is, in fact, giving a clubbing to the public. This dangerous weapon, whether we term it strike or economic force, is one that does violence to the principles of popular government.

The Commission interprets the public attitude as seeking from the unions "satisfactory guarantees of a fair and orderly adjustment of controversies in other ways than by the exercise of economic force" and the practical problem we face is to find a substitute for force. The Commission has recommended voluntary arbitration for settling disputes and has also urged the fundamentally constructive method of building up the day-to-day relations between employee and employer, as well as the method of continuous investigation and timely publicity, yet full success of governmental action of this type, as the Commission realizes, would depend upon the recognition by operators and workers alike of the "finality of the public insistence on continuous operation."

Compulsory Arbitration the Last Resort

If, however, either party to the controversy is unmoved by this "irresistible moral pressure implicit in their joint obligation to furnish the public with coal" it becomes all too obvious that arbitration must be compulsory. The outright rejection by the United Mine Workers at Atlantic City of any arbitration was most disheartening to many who wished the union well. Such use of monopoly power at once forces the issue and the public's right to its coal demands protection from the strike. With that experience so fresh in mind and the threat of a bituminous strike next Spring already heard the Commisssion might well have hesitated to wholly abandon the idea of compulsory arbitration as a legal defence against those who declare industrial war against the whole people. Some of us believed that in default of a voluntary agreement compulsory arbitration would have afforded a more equitable adjustment of the recent anthracite controversy than the terms finally agreed upon. In the bituminous industry, however, compulsory arbitration of a wage scale structure, to be fully successful as an agency of economic welfare, would need to have its awards enforceable throughout all coal fields, whether or

* The best summary of the "Recommendations of the United States Coal Commission," thus far made was presented before the American Academy of Political and Social Science at Philadelphia on November 17 by Edward Eyre Hunt, Secretary of the Commission.

nized or unorganized. If coal mining, like transrtation, is clothed with a public interest so great at its uninterrupted service requires public supersion of settlement of wage disputes, then those wage tes must be governed only by economic conditions, neral and local, not by membership or non-membership in a union. The need of continuity of mine operaon appears to involve mine worker and mine operator ike in a relation to the public quite different from at prevailing in less essential industries, and public fety and general welfare must soon force such legslation as will insure an uninterrupted, supply of al.

The Coal Commission, moreover, sees other possilities for the mine workers' organization: in a tranition from militancy to efficiency, the union thus beming an active agency in improving the individual orker's status; in a program of education in mine fety, where joint action of operator and miner alone an fully protect their common interest; in a drive r Americanization and better citizenship, with the nprovement of local living conditions; and above all, building up the general realization that coal ming at its best is a cooperative enterprise that must be ccessful if it is to yield wages and profits. This mmon interest in continuous and successful operaon is being stimulated in the British coal mines by e present adjustment of wages to results.

Waste by Consumers

Any turn-about-face in the policy and tactics of the nion leaders, however, can not be expected unless a milar reversal is made in the attitude of many of the perators — the employee in his period of dominance as copied all too much the earlier practices of the mployer. Operators, like mine workers, have refused o arbitrate, and arrogance and tyranny were not inented by labor leaders. Yet the Commission has not ubscribed to the belief that business and society are o without hope that what has been wrong in the past an not be rectified either in the present or in the uture.

In addressing advice to the consumer the Commision not only points out his responsibility for exorbiant prices but invites his attention to his own wasteul practices, fuel economy being his means of lowerng heating costs even when coal prices are rising. Throughout the investigation it was evident that veryone in the long line from householder to coal niner wishes someone else reformed and even regulated by law if need be. In fixing the place where something should be done the zeal appears to increase directly as the square of the distance of that place from home, and the average citizen's appraisal of the value of the work of the U. S. Coal Commission is likely to be affected by the direction in which its recommendations are aimed. Recommendations that involve all concerned plainly can not be expected to win general acceptance.

METALLURGICAL TRAINING IN INDIA

The progress of meallurgy in India is well marked by the recent establishment at Jamshedpur, the iron and steel centre in Bengal, of a Metallurgical Institute for the training of young men for the industry. Local governments have joined with the Tata Iron and Steel Co. in contributions for its support. Copper and other ores are mined and smelted in this district in addition to iron.

ADVANTAGE OF AFTERCOOLING COMPRESSED AIR

by F. A. McLean

Under almost all conditions, the atmosphere contains moisture. When this air is compressed and cooled much of the moisture is precipitated, with a resulting shrinkage in volume and the loss of the power consumed in compressing the vapor. This condensation process takes place in ordinary pipe-lines as used around plants, because of the radiation of heat to the atmosphere.

It is a well known fact that moisture in compressed air pipe-lines ultimately reaches the drills or tools. This moisture has two detrimental effects. First, it washes away the lubricating oil, causing excessive wear in the drills with high maintainance charges. The second trouble is that, due to the low temperature caused by expansion of the air in the tool, the moisture freezes in the valves, ports, etc., greatly interfering with the operation of the drill or tool. Production is retarded, if not stopped altogether, by this accumulation of ice.

It has been found from experience that it pays to keep pneumatic equipment working at full capacity as much of the time as possible, even though it may require additional outlay for equipment and power to do so. In most compressed air plants where the air is used for operating rock drills or pneumatic tools, it therefore pays to eliminate the troubles caused by moisture.

Two methods are available; one to take into the compressor dry air only and use it at the tools with as little loss of heat as possible. This is the ideal solution, but it is physically impossible. The second method is to remove as much moisture as possible from the air after it has been compressed, and before it is used in the tools. This can be most readily done by means of an after-cooler, which simply reduces the temperature of the air after compression and precipitates the major part of the moisture.

Due to the reduction in temperature caused by cooling the air, there is also a reduction in volume. This means that a smaller volume has to be transmitted through the pipe line, which in turn means a lesser pressure drop, or a saving in power. This saving in power partially offsets the loss in internal energy caused by the reduction in temperature during the process of cooling.

In addition to the foregoing advantages in the use of an after-cooler, there is another which is worth consideration; there is less expansion of the pipe-lines, due to the uniform and low temperature of the air entering them.

Still another advantage is the precipitation of lubricating oil at a point where it can be easily drained from the system, reducing the rotting of rubber gaskets and hose, if used. The advantages may be summed up as follows:

(1) Elimination of freezing troubles.
(2) Less wear on drills or tools.
(3) More production from men and tools.
(4) Less pressure drop in lines, which means more work for the same power expended in compressing the air.
(5) Elimination of expansion strains in pipe lines.
(6) Removal of oil from air.

THE COPPER SITUATION

The following study of the copper market is from the *Granby News,* published by the Community League at Anyox, B. C., and many be regarded as an informed statement of present conditions.

The wish being father to the thought, the average writer of articles pertaining to industries invariably makes a brave attempt to inject some optimism into his lines, no matter how sad the situation really is. Not so with Mr. G. F. Cheveling, Associate Editor of *The Daily Metal Trade,* whose article in the *Annalist* of recent date tells some cogent truths about the copper outlook. Mr. Cheveling says, in part:

"The curtailment of production in 1921 was undertaken by leading copper producing companies in the U. S. because there was an oversupply of metal due to the inheritance of war time stocks of scrap and virgin copper as well as a high rate of new production. Most of the important mines and smelters shut down in that year. Now in 1923 they are facing a curtailment because the higher cost companies cannot produce for less than 13 cents. Some small properties in Montana have already closed; and all this is happening in the closing months of a year which has seen the largest domestic consumption of copper of any peace time year of copper history. It has been essentially a buyer's market. Had consumption of copper increased in other countries in proportion as it has in the U. S., the present world copper capacity would be short of world demands. Due to political troubles in Europe, this is not so. The post-war consumption of copper for the world has fallen short of pre-war years. In the three pre-war years, export shipments of refined copper averaged over fifty per cent of total American shipments, while in four post-war years the proportion shipped for export dropped to 32.7 per cent, and the proportion shipped for domestic consumption increased to 67.3 per cent. The actual loss and further threatened loss of export copper have played a vital part in the 1923 copper market; and changing from week to week, European politics continue to baffle analysis, and the end is not in sight."

Copper is a true international metal, its trade being unhampered by tariff duties or trade barriers. The entire world copper market seeks a common level the same as water does. The increase or decrease in the demand for copper in any part of the world is reflected in the market as a whole, just as the increase in production in any district of the world has its relative bearing on the market. European consumption of copper is most important to American copper sellers. Fearing that the trouble in the Ruhr would reduce consumption, was a factor in inducing sellers to sell metal to avoid accumulating excess stock. Between March and September 1st, however, stocks of unsold refined copper did not increase. Monthly shipments for the first eight months of 1923 averaged 192,000,000 pounds, while production averaged only 176,000,000 pounds. With September, the situation became entirely different. Total shipments in that month were 160.000.000 pounds, while the production was 200.000.000 pounds. Germany, usually the best customer, bought practically no copper and French takings increased but slightly.

The combined copper output of North and South America is now about 75 per cent of world production. South American copper is now controlled by North American interests. Its development will have a potential bearing upon the market because it is the lowest cost production in the world, the Chili Copper Company having that honor. It will produce 250,000,000 pounds of copper this year. All South American as well as African copper has a direct bearing upon basic American copper price levels, as most of it s brought to the U. S. for refining an immediately assumes a competitive position.

Any analysis of the copper outlook must contain thre considerations. 1. Effects upon world consumption o foreign political conditions. 2. The tendency toward increased supplies of low cost copper produced in oth countries. 3. The outlook for copper business in the lea ing consuming country, the United States. Regardin the first consideration, the European situation continu so uncertain that it is impossible to make any calculati for the immediate future. In spite of all the troub however, Europe has been taking a surprising amount copper. Whether these takings will increase or decrea in the near future, no one can predict. Eventually th takings must increase. Settlement of the reparations question should restore credit and confidence. All th requisites for large European buying exists, except cred and stability, and these await international political co cord, which is so discouragingly slow in making its a pearance. The second consideration, the growth of for eign low cost production, is here to stay. In times of d pression, this low cost copper production is bound to su plant higher cost U. S. copper. In respect to the third consideration, the outlook is dependant upon general business in the United States. In 1923, the electric ind took 60 per cent of all copper used in the country, wh not a little was taken by the building trades and automo bile industry.

Copper is undeniably cheap at the present time. Its average for the past twenty years has been slightly ov 17 cents. Without doubt copper will again sell for mor than thirteen cents. In the meantime, there is no com modity in the production of which the struggle for th survival of the fittest is more pronounced than in the case of copper. The large interests are just as much concerned as the smaller producers. Mr. Cheveling does not see any possibility of a general shut down such as occurred in 1921, but expects that the next reduction in output will be brought about by the enforced closing of the higher cost companies. Just how much lower the price will have to drop to bring this about cannot be fore cast; for up to a certain point it is less costly to operate at a loss than it is to close down completely.

ELECTRICAL CONDUCTIVITY OF REFRACTORY MATERIALS AT HIGH TEMPERATURES

Reliable and comparable data are needed on the electrical resistivity at high temperatures of the refractory materials suitable for furnace linings. In the performance of experimental work by the Bureau of Mines Ceramic Experiment Station, Columbus, Ohio, methods and apparatus for making such measurements have been developed. Test pieces for determination of the electrical resistance were prepared from fire clay, kaolin, alundum, diaspore, thoria, silica, crystal magnesite, silicon carbide, sillimanite, zirkite, and magnesium spinel. Resistance measurements have been run on half the pieces. Carbon electrodes are employed, measurements being run in an atmosphere of pure nitrogen to a temperature of 1400 deg. C. in a gas-tight platinum-resistance furnace.

METAL MARKETS

Prices in carload lots, f.o.b. Montreal, as quoted by Consolidated M. & S. Co.

Average for period Nov. 12-20

Electrolytic copper, per lb.	15.10
Zinc, per lb.	8.00
Lead, per lb.	7.75

THE MINING DISTRICTS

BY THE JOURNAL'S CORRESPONDENTS

NORTHERN ONTARIO

Hollinger's Progress. — With the last dividend cheque, the Hollinger sent out an interim report to its shareholders, covering the year to October 7th. A good deal of the information regarding the operations of the company has been given in recent issues of the "Canadian Mining Journal". A large part of the report is devoted to the question of power and litigation. The company states that the power development at Island Portage on the Abitibi River is being pressed with all possible dispatch, with a view to its completion by the first of August, 1924.. Contracts for practically everything has been let, except for the clearing of the right-of-way. A spur line connecting the power site with the T. & N. O. Ry. will soon be completed, a total of 450 men being employed on the work. The report states that the immediate development contemplates two units of 12,500 h.p. each, with provisions to increase to the full capacity of the Abitibi river at this point when the demand for power warrants it, and that notwithstanding reports to the contrary, the permission of the Ontario Government was obtained for the development of the power based on a 60-foot regulated head. The question of power disputes now before the courts is also dealt with at some length.

Porcupine. — It is reported that the Premier Paymaster and United Mineral Lands properties in Porcupine will be amalgamated. These two properties, which adjoin, are controlled by Boston people, headed by E. H. Walker, which also owns properties in Butte, Montana, of which the principal one is the Crystal Copper Company. Some spectacular gold has been found on both the Paymaster and the United Mineral Lands, and on the former property a shaft has been sunk to a depth of 600 feet, and will be continued to 1,000 feet. On the United Mineral Lands a good deal of diamond-drilling has been done, which is stated to have proven the existence of high-grade ore-bodies to a depth of 1,000 feet. A number of workmen's houses are being built, which will enable the company to largely increase its working force, and equipment is being installed for the complete electrifying of both properties. When this installation is completed, a shaft will be sunk on the United Mineral Lands, and as the shaft on the Paymaster is deepened, levels will be opened at 600, 800 and 1,000 feet. It is stated that half a million dollars has been spent on these properties to date, and that the plans of the company call for the expenditure of approximately one and one-half million dollars, which will include the building of a mill.

It is understood that at present Dome costs are below $4.00 a ton, and as the ore is averaging about $12.00, this leaves a very substantial margin of profit. The company has a sufficient supply of both labor and power, and although no announcements have been made recently regarding developments, they are understood to be satisfactory.

At the annual meeting of the Goldale, it was stated that negotiations are on foot for the amalgamation of the Goldale, Plenaurum and Armstrong Booth, but nothing has yet been concluded, and it is understood, from outside sources, that negotiations are practically at a standstill. The reason for this is that in the Plenaurum company, which is a necessary part of the proposed merger, the McIntyre holds over 40 per cent. stock interest, and that company prefers to take acreage for its stock rather than go into a new company. This is not satisfactory to the other interest involved, and neither party appears to be able to get control. It was stated at the meeting that if the development on the 1,000-foot level succeeded in finding sufficiently large bodies of commercial ore, the Schumacher mill might be either purchased or leased, and that to bring the property to a producing stage and build the necessary tramway and make the necessary alterations to the mill, would require an outlay of approximately $100,000.

Kirkland. — The annual report of the Teck-Hughes for the year ending August 31st shows a record income of $998,000, of which $530,000 was profit. The company now has sufficient funds to pay off the bonds, which mature next January, and to provide a surplus of approximately $300,000. During the year the mill treated 34,690 tons, and recovered bullion to the value of $981,500, or an average of $28.30 a ton, which is a record for Ontario gold mines. Gross recovery was $981,000, operating costs being $400,000, or $11.55 a ton. Broken ore reserves now stand at 36,256 tons, and total ore reserves are shown at 126,683 tons, averaging $20.00 a ton, which is an increase in gross value of $1,350,000, as compared with the previous year. Development was continued to a depth of 1,100 feet, and the work done during the year continued to be satisfactory, particularly on the Orr property, which the company purchased. It is understood that during the month of October production amounted to $93,000.

Better results are being obtained at the Argonaut Mine, and not only is the tonnage being increased, but the grade of the ore is better. The mill is now treating approximately 100 tons a day, of about $15.00 grade, which allows a substantial margin of profit. During 18 days in October, which was a short month on account of the break-down of some of the mill machinery, the mill averaged 102 tons a day and recovered $23,500.

A recent discovery has been made at a depth of 180 feet on the Lebel-Oro, which appears to be of importance, as assays running from $6.00 to over $250.00 for a width of about 6 feet have been obtained.

At a meeting of the Bidgood, which is to be held shortly, shareholders will be asked to ratify a proposal of the directors to sell its assets to a new company, which it is proposed to form. The new company is to be capitalized at $3,000,000, and one share of the new company will be given for each two shares in the old company, which will leave 1,500,000 shares in the treasury. This treasury stock is for the purpose of providing further money for the development of the property. It is stated that several offers have been made, and it is understood that the McKinley Darragh is interested.

BRITISH COLUMBIA

Institute Meeting at Nanaimo. — At the annual meeting of the Canadian Institute of Mining and Metallurgy (Vancouver Island Division) held at Nanaimo on October 31st last, officers were elected as follows: Chairman, Charles Graham; General Superintendent Canadian Collieries (D) Ltd.; Vice-Chairman, C. M. Campbell, General Superintendent Granby Coal & Coke Co.; Secretary-Treasurer, Wm. H. Moore, Western Fuel Co., of Canada; Executive, George O'Brien, Cumberland; Robt. Henderson, Nanaimo; Charles Touhey, Cassidy; and T. A. Spruston, Ladysmith. An address was given by Hugh F. Marriott, of London, England, who was passing through the province in the course of a tour of the Empire. He explained that he was working on the organization of an Empire Federation of Mining Engineers, that he had visited South Africa, Australia, and New Zealand with good results, and that he was desirous of obtaining the co-operation of all in making the Empire Exhibition of next year in London an outstanding event in point of its mineral exhibits, as well as by developing a closer union and a better understanding among men of the profession throughout the Empire.

Trail Ore Receipts. — Ore receipts at the Trail Smelter, Consolidated Mining & Smelting Co., for the week October 22nd to 31st, totalled 7,383 tons. The detailed shipments follow:

	Tons
Alamo, Alamo	102
Bell, Beaverdell	43
Company Mines	5,989
Cork Province, Zwicky	148
Elkhorn, Sandon	4
Gem, Sandon	25
Knob Hill, Republic Wn.	136
Lightning Peak, Edgewood	2
Lone Pine, Republic Wn.	310
Paradise, Invermere	69
Quilp, Republic Wn.	166
Sally, Beaverdell	47
Sailor Boy, Crawford Bay	8
Silversmith, Sandon	269
Surprise, Sandon	29
Van Roi, Silverton	36
	7,383

Flood at Anyox. — Some fifteen inches of rain fell at Anyox, headquarters of the Granby Consolidated Mining & Smelting Co., in little more than three days and resulted in a mudslide that damaged the dam and otherwise interfered with the Company's operations. The plant was idle for the week commencing the 4th November, repairs necessary to permit resumption not having been completed until Saturday the 10th November. This is an unusual occurrence although the northwest coast of British Columbia has a reputation for heavy rains.

Indian Mines Stock. — There is considerable local interest in the announcement that the Indian Mines Ltd., operating in the Portland Canal district of British Columbia, has been listed on the Montreal stock exchange. This is the first company with holdings in the Salmon River section of the new western Canadian mining camp to go on the Canadian stock exchange boards.

Interest in Whitewater District. — Reports of the mineral riches of the Whitewater district, an area of exceptional promise northeast of Lillooet, have been in circulation recently. The region is set among mountain ranges and so is difficult of access. It is practically virgin ground, the high rock walls with which it is girded having discouraged prospecting in the past and having dampened the enthusiasm of settlers who might have been attracted by the wonderful fertility of its soil.

A few years ago the Provincial Department of Mines, presented with apparently reliable information regarding extensive deposits of limonite ore in the Whitewater, appointed an engineer to spend a summer in the district investigating the commercial possibilities of these deposits. The report was that considerable bodies of the ore existed but that the tonnage was not as great as had been represented; that while limonite covered large areas, boring showed there was little average depth to the material. As an important source of ore it was thus relatively unimportant, especially in view of the fact that actual mining operations would have to be preceded by the provision, at much expense, of adequate transportation facilities.

Resident Mining Engineer's Statement. — While however, the report on the bodies of limonite was unsatisfactory economically, the activity of the Department of Mines threw the light of publicity upon the Whitewater district and stimulated general prospecting. The discovery of tellurides of gold was announced and the arrival of a miner carrying a substantial amount of gold, taken from his property by the most primitive means, caused a stir in mining circles of the Coast. Since then the district has been more thoroughly prospected and many claims have been staked, some being partially developed. Owing to the tendency to exaggeration found in frequent newspaper references to the size of high-grade ore bodies uncovered in the Whitewater district, Major A. W. Davis, resident government mining engineer, who visited the section this year, has issued the following brief but frank statement:

Editor Province — There is so much publicity being given the Whitewater district, west of Lillooet, that I consider it necessary to make a few remarks on the matter myself. I take it that the general public is entitled to my idea of the situation in view of what I consider the misleading descriptions of the area which are being spread around the country.

To be brief I consider the Whitewater a likely place for prospecting, although at the time of my last visit in August, this year, nothing had been opened up that would reasonably ensure a producing mine on a permanent basis. The Windfall group at that time had a lot of rich float in evidence, but very little ore in place and several hundred feet of underground work then in existence had failed to produce any. I, however, consider it quite a legitimate gamble to continue looking for it. In this connection I wish to call attention to the fact that the high assays I got in 1922 on this property, which are quoted in the prospectus of the company operating the group, do not represent any tonnage.

The Massena group, operated by the company controlling the Windfall Mine, I visited in 1922 and also this year. I find that there is no justification in fact for the extravagant claims made for the property by this same company as late as this summer. There is

no tonnage of ore of a commercial grade in evidence on the ground.

Accounts of the district describing it as a second "Rand" and in which enormous dykes showing coarse gold are referred to are not true. The genuine prospector does not benefit by this kind of thing. Not much money changes hands nowadays before the purchaser has looked over the ground and this kind of thing creates the wrong atmosphere for the visiting investor and possibly turns him against some claim which with development might turn out successfully.

A. W. DAVIS,
Resident Engineer.

Kamloops, November 10.

ALBERTA

There was a conference recently between Hon. Charles Stewart, Minister of the interior in the Dominion Government, and members of the Government of the province of Alberta with a view to having the province take over the supervision of fuel conservation work in conjunction with the regular inspection of mines. The latter now is the duty of the Province. Hon. Mr. Stewart explained that it was hoped that the present overlapping between the two governments would be eliminated. He pointed out that the Dominion now is mainly concerned in the question of the conservation of fuel and it was felt that the Province might undertake this work as well as the regular inspection of mining operations.

NOVA SCOTIA

Increased Coal Output. — The coal outputs of the Dominion collieries are still increasing. The latest high day bordered on 18,000 tons, and yet, early in the year, we counted 15,000 tons a large day's work. Surely with two collieries still idle such outputs should be very satisfactory even to a corporation reaching for big things. It goes to show that Nova Scotia has both the mineral and the men who can mine it, and there is little need to go outside the province for expert mining men. This is fully realised by the public at large and although now and again a little advice from those of other districts may be helpful, the burden and responsibility of the mining falls to the lot of the native sons of the province.

Steel Plant Council in Action. — The Sydney Steel Plant Council have taken up the matter of the eight-hour day and are making a preliminary survey. At first sight it appears a simple question, but closer acquaintance proves its complexity. It has many sides and some of these are rather thorny. This has been the experience of one of the largest steel corporations of the United States. An eight-hour day and six days a week seems ideal for the steel industry. But all the workmen wanted to have Sunday off, and all objected to the reduction of pay consequent upon the shorter hours. Nevertheless many realize that the short day and the weekly rest day have come to the steel industry to stay, and here in Nova Scotia, as in the United States, all will settle down into the new habits. It is very satisfactory to have the matter in the hands of the Sydney Steel Plant Council for adoption and adjustment.

Demonstrations with Explosives. — Since the visit of Edward Godfrey of the Canadian Explosives Limited there has been much activity among the shotfirers of Cape Breton collieries. Taking advantage of his visit, the Dominion Coal Company, believing there is always something new to learn, had Mr. Godfrey conduct a few experiments with the explosive in most general use — Monobel No. 3. Thinking it might be useful to be able to tell when the explosive is at full strength, Mr. Godfrey demonstrated the matter in a very simple way. Taking a cartridge of Monobel, he cut it in halves and wrapped it up in paper, taking care to keep an air space of six inches between the two parts. On setting off the detonator the air space was bridged and the explosive was set off. Defective powder will not give results over this distance and sometimes an air space of two inches will not be bridged. To show that there is a right and wrong way of inserting the detonator, it was put into the cartridge on an angle instead of directly in the end. It failed to jump the six inch space and got down as low as one inch. There is even a difference in the end in which the detonator is put into the cartridge, if the explosive has absorbed moisture. It was pointed out by Mr. Godfrey that the open end of the cartridge is the first to be affected by moisture and to be sure that perfect detonation takes place the detonator should be placed in the opposite end.

Since this demonstration the Chief Inspector of Mines, Alexander McEachern, has had all the shotfirers at the collieries fully instructed in the proper method of placing detonators in cartridges. This may appear a very simple matter, but those who mine coal know the dangers and delays of mis-shots, and a little knowledge gained in this way may save time and keep the miner from running unnecessary risks.

The visit of Mr. Godfrey was an education to the busy mine officials of Cape Breton and a means of education to the men who use explosives in the mine each day. It will help to make mining safer for explosives cannot be handled too carefully. Again there is much saving to the miner, who has to pay for the explosives, in knowing how to obtain the best results.

CHARCOAL PRECIPITATION FROM CYANIDE SOLUTIONS

Research work is being continued by the Department of the Interior at the Rare and Precious Metals Experiment station of the Bureau of Mines, Reno, Nevada, to determine whether the use of charcoal for precipitating gold and silver from cyanide solutions is feasible. If charcoal could be used, it would have many advantages on account of its cheapness. It has been found that charcoal would precipitate gold and silver from a cyanide pulp (ore and cyanide solution) and that this loaded charcoal could be readily floated away from the pulp. Counter current charcoal precipitation on Tonopah Extension mill solution proved satisfactory, acting very quickly with complete precipitation on fresh [illegible]. Many kinds of charcoals were tested, and many different treatments of charcoal tried for their precipitating efficiencies. For general conditions it seems that no charcoal has any outstanding advantage over any other. Most treatments of charcoal that give advantageous results can be traced to a heat treatment whereby oxidation of the inert carbon is effected either by air or steam. Very few fouling agents in cyanide solutions affect the precipitation of gold and silver on charcoal. One of the principal problems is to recover the precipitated metals.

A number of solvents were found for the gold or silver precipitated on charcoal. These generally act much more vigorously if hot. A hot cyanide solution is a very effective solvent for both gold and silver. Hot water dissolves a considerable amount of the gold and silver.

Electrolytic separation of the precipitated gold or silver on charcoal from cyanide gave only indifferent results and does not appear promising.

Promising results were obtained in the use of sodium sulphide in connection with charcoal as a silver precipitant. Cyanide is regenerated in this case, and excess of sodium sulphite is taken care of by absorption on the charcoal if the excess is not too large. This sulphide charcoal precipitation is detrimental, however, in gold precipitation.

The theory that some chemical treatment of a loaded charcoal would so change the absorbed gold and silver as to re-activate the charcoal for a new load was given some attention. Such a chemical may be called a "fixer". It was found that nitric acid has some power as a fixer, but that hydrochloric acid has none. More experimental work is needed to determine whether reactivation would be a feasible step in a charcoal process. Much progress has been made by the Bureau of Mines in working out the chemistry of the process, and fundamental data have been obtained on the mechanism of the precipitation of gold and silver on charcoal.

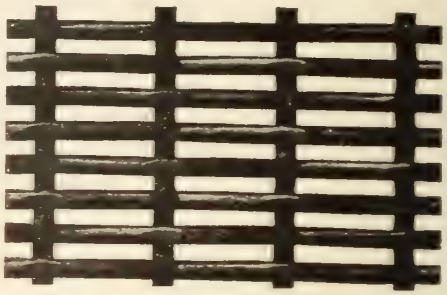
CONVERSION OF CLAYS TO ALUMINUM SULPHATE

In connection with the development of a simple cheap process of preparing pure solutions of aluminum sulphate, work has been undertaken by the Department of the Interior at the Pacific Experiment Station of the Bureau of Mines on sulphating clays by various methods. Sulphate roasting, using gases containing varying amounts of sulphur dioxide to sulphate the aluminum silicate of the clays proved impracticable, but favorable results were obtained by treating the clays with sulphuric acid. A wide series of aluminum silicate products was treated at various temperatures with differing strengths of acid. In general, nearly all the silicates were decomposed with fair efficiency at temperatures up to 200° C. and with acids containing 50 per cent to 70 per cent sulphuric acid. The easiest silicate to decompose was bentonite, but many of the kaolins were quite easily attacked. Feldspars are much more resistant. These experiments are being conducted by G. S. Tilley, assistant physical chemist.

MOVEMENT AGAINST U. S. ARSENIC DUTIES

A movement has been organized in the southern United States with a view to securing the importation of arsenic free of duty. Only ten per cent. of the cotton crop was treated with arsenic compounds during the past season, and the ravages of the boll weevil continue almost without abatement.

POSITION WANTED—Position as assistant in metallurgical laboratory by graduate in chemistry of Technical School. Box 626, Canadian Mining Journal, Gardenvale, Que.



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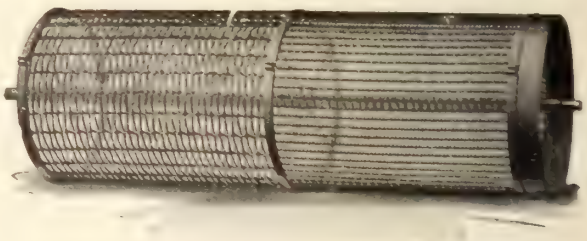

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By virtue of a Writ of Fieri facias issued out of the Supreme Court of Ontario to me directed and delivered against the goods and chattels, lands and tenements of J. A. Seybold, defendant arising out of the suit of L. P. Hughes, administrator of the estate of A. M. Chisholm, vs J. A. Seybold, I will offer for sale by tender en bloc or separately all the mining interests in the North Half of Lot Number Five (5) in the Fourteenth Concession of the Township of Sheffield containing one hundred acres more or less known as Chisholm's Mine and also a quantity of heavy mining machinery consisting of rolls and flotation table.

On the property is a blacksmith shop, large building for processing and other buildings.

The ore is said to be molybdenite ore and other valuable minerals.

Tenders will be opened at my office at the Court House in the Town of Napanee on Thursday December 28th, 1923 at 2 o'clock P. M. Each tender must be accompanied by a certified cheque for ten percent of the sum tendered which will be returned to the tenderer in case his offer is not accepted. The highest or any tender not necessarily accepted. Envelopes to be marked "Tenders for Mine."

C. W. VANDERVOORT

Sheriff

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MINES BRANCH

Recent Publications

Talc and Soapstone in Canada, by H. S. Spence.

Titanium, by A. H. A. Robinson.

Summary Report of Investigations made by the Mines Branch during the calendar year ending Dec. 31, 1921.

Phosphate in Canada, by H. S. Spence.

The Preparation, Transportation and Combustion of Powdered Coal, by John Blizard.

Road Materials along the St. Lawrence River, from Quebec Boundary to Cardinal, Ont., by R. H. Picher.

Barium and Strontium in Canada, by H. S. Spence.

The Coal-fields and Coal Industry of Eastern Canada, by F. W. Gray.

Analyses of Canadian Fuels. Part I to V, by E. Stansfield, M. Sc., and J. H. H. Nicholls, M. Sc.

Graphite, by H. S. Spence.

Gas Producer Trials with Alberta Coals, by J. Blizard and E. S. Malloch.

The Mines Branch maintains the following laboratories in which investigations are made with a view to assisting in the developing of the general mining industry of Canada:—

Fuel Testing Laboratory.—Testing value of Canadian fuels for steam raising and production of power gas; analyses, and other chemical and physical examinations of solid, liquid and gaseous fuels are also made.

Ore-Dressing Laboratory.—Testing of Canadian ores and minerals, to ascertain most economical methods of treatment.

Chemical Laboratory — Analyzing and assaying of all mineral substances and their manufactured products. Copies of schedules of fees, which are slightly in excess of those charged by private practitioners, may be had on application.

Ceramic Laboratory.—Equipment is such that complete physical tests on clays and shales of the Dominion can be made, to determine their value from an economic standpoint.

Structural Materials Laboratory.—Experimental work on sands, cements and limes is also undertaken.

Applications for reports and particulars relative to having investigations made in the several laboratories should be addressed to **The Director, Mines Branch, Department of Mines, Ottawa.**

GEOLOGICAL SURVEY

Recent Publications

Memoir 108. The Mackenzie River Basin, by Charles Camsell and Wyatt Malcolm.

Memoir 127. Beauceville map-area, Quebec, by B. R. MacKay.

Memoir 128. Winnipegosis and Upper Whitemouth River areas, Manitoba, Pleistocene and Recent deposits, by W. A. Johnston.

Memoir 129. Geology of the Moncton map area, by W. [illegible] Wright.

Memoir 130. Geology and mineral deposits of the Bridge River map-area, British Columbia, by W. S. McCa[illegible]

Memoir 131. Kenogami, Round and Larder Lake areas.

Memoir 132. Geology and ore deposits of Salmon River district, British Columbia, by S. J. Schofield and G. Hanson.

Memoir 133. The southern part of the Sydney coal field, Nova Scotia, by A. O. Hayes and W. A. Bell.

Map 68A. Moncton, New Brunswick. Geology.

Map 155A. Portions of the districts of Algoma, Sudbury and Timiskaming, Ontario. Geology.

Map 1585. Mackenzie River basin, 1922 edition. Geology.

Map 1751. Wainwright, Alberta. Topography.

Map 1752. Monitor, Alberta and Saskatchewan. Topography.

Map 1767. Sydney, Nova Scotia. Geology.

Map 1830. Vermilion; townships 47 to 55, ranges 5 to 10, west of the fourth meridian. Topography.

Map 1831. Vegreville; townships 47 to 55, ranges 11 to 16 west of the 4th meridian, Alberta. Topography.

Map 1860. Keno Hill area, Mayo district, Yukon. Geology.

Map 1948. Wanapitei Lake area, Ont. Geology.

Map 1964 [illegible] Ontario. Geology.

Map 1965. Fraser River delta, British Columbia. Geology.

Map 1972. Michipicoten area, Ontario. Geology.

Map 1977. Mackenzie river between Norman and Beaver river, district of Mackenzie. Geology.

Applicants for publications not listed above should mention the precise area concerning which information is desired.

Summary Report — The annual Summary Report of the Geological Survey is now printed in parts. Applicants should, therefore, state what particular geological report is required, or what subject they are interested in.

The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon.

Communications should be addressed to **The Director Geological Survey, Ottawa.**

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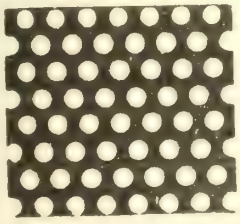

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Addresses of advertisers whose names appear in the following classified index, may be found upon reference to their advertisements. An alphabetical index to advertisers will be found on the page facing the inside back cover. The following regulations apply to all advertisers: — One-eighth page, every issue, three headings; one-quarter page, every issue, six headings; one-half page, every issue, twelve headings, full page, every issue, twenty-four headings. Buyers who are unable to find in the classification here given such machinery or supplies as they desire are invited to write Service Dept., Canadian Mining Journal, Gardenvale, Que., who can, in all probability, refer them to proper sources.

Acetylene Lamps:
Canadian Fairbanks-Morse Co., Ltd.
Dewar Manufacturing Co., Inc.

Agitators:
The Dorr Co.

Air Compressors:
Belliss & Morcom Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Canadian Fairbanks-Morse Co., Ltd
Denver Rock Drill Mfg. Co., Ltd.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Laurie & Lamb.
Sullivan Machinery.

Air Hoists:
Canadian Ingersoll-Rand Co. Ltd.
Canadian Fairbanks-Morse Co., Ltd.
Denver Rock Drill Mfg. Co.
Herbert, Alfred, Limited.
Holman Bros. Ltd.

Air Receivers:
Canadian Ingersoll-Rand Co., Ltd.

Alloy & Carbon Tool Steel:
Peacock Bros. Ltd.

Amalgamators:
Mine & Smelter Supply Co

Ash Handling Machinery:
Link-Belt Limited.
Canadian Mead-Morrison Co
Powley & Moody, Limited

Assayers and Chemists:
Ledoux & Co.
Thos. Heyes & Son.

Assayer's and Chemists' Supplies:
Lymans, Limited.
Mine & Smelter Supply Co.

Balances — Assay & Analytical:
Mine & Smelter Supply.

Balls:
Herbert, Alfred, Limited
Holman Bros.; Ltd.
Hull Iron & Steel Foundries, Ltd
Peacock Brothers, Limited.
The William Kennedy & Sons, Ltd

Ball Mills:
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Hull Iron & Steel Foundries, Ltd
Mine & Smelter Supply.

Ball Mill Feeders:
Herbert, Alfred, Limited.
Holman Bros. Ltd.
Hull Iron & Smelter Supply
Mine & Smelter Supply.

Ball Mill Linings:
Canadian Steel Foundries, Ltd.
The William Kennedy & Sons, Ltd
Peacock Bros., Ltd.
Hull Iron & Steel Foundries, Ltd
Mine & Smelter Supply.

Bearings:
Canadian Fairbanks-Morse Co., Ltd.
Dodge Manufacturing Co.

Belt Clamps:
Dodge Manufacturing Co

Belt Conveyers:
Dodge Manufacturing Co.

Belting — Leather, Rubber & Cotton:
Link-Belt Limited.
Jones & Glassco (Regd.).

Belting:
Canadian Fairbanks-Morse Co., Ltd
Gutta Percha & Rubber, Ltd

Belting (Conveyor):
Canadian Fairbanks-Morse Co., Ltd
Gutta Percha & Rubber Ltd.
Dodge Manufacturing Co.
Dunlop Tire & Rubber Co., Ltd

Belting — Silent Chain:
Link-Belt Limited.
Hans Renold of Canada, Ltd
Jones & Glassco (Regd.)

Bins & Hoppers:
Hendrick Manufacturing Co.
The William Kennedy & Sons, Ltd

Bluestone:
The Consol'd Mining & Smelting Co

Boilers:
The William Kennedy & Sons, Ltd

Boxes, Cable Junction:
Dodge Manufacturing Co.
Standard Underground Cable Co. of Canada, Ltd.
Northern Electric Co., Ltd

Brackets:
Dodge Manufacturing Co

Brazilian Ballas:
Diamond Drill Carbon Co.

Bronze, Manganese, Perforated & Plain:
Hendrick Manufacturing Co.

Buckets:
Canadian Ingersoll-Rand Co., Ltd
Canadian Fairbanks-Morse Co. Ltd
Dodge Manufacturing Co
Hadfields Limited
Hendrick Manufacturing Co
Herbert, Alfred, Limited
Holman Bros., Ltd
Link-Belt Limited.
The William Kennedy & Sons, Ltd
Peacock Bros., Ltd

Bucket Lips:
Canadian Steel Foundries Ltd
The William Kennedy & Sons Ltd

Buggies, Mine Car (Steel):
Hendrick Manufacturing Co
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Powley & Moody, Limited

Bushings:
Dodge Manufacturing Co

Cable — Aerial and Underground:
Canada Wire & Cable Co.
Standard Underground Cable Co of Canada, Ltd
Peacock Brothers, Limited

Cables — Wire:
Standard Underground Cable Co. of Canada Ltd.
Canada Wire & Cable Co.
Peacock Bros. Ltd.

Cable Railway Systems:
Canada Wire & Cable Co.

Cages:
Canadian Ingersoll-Rand Co. Ltd.
The Mine & Smelter Supply Co.
Herbert, Alfred, Limited.
Holman, Ltd.
The William Kennedy & Sons, Ltd.

Cam Shafts:
Canada Foundries & Forgings, Ltd.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
Powley & Moody, Limited.
Peacock Brothers, Ltd.

Cars:
Canadian Mead-Morrison Co.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
John J. Gartshore.
Peacock Brothers, Limited.
Powley & Moody, Limited.
The William Kennedy & Sons, Ltd

Car Dump:
Canadian Mead-Morrison Co.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Powley & Moody, Limited.
Sullivan Machinery Co.

Cars—Hand:
Sylvester Mfg. Co., Ltd.

Cars—Mine:
William Kennedy & Sons Ltd.

Car Pullers:
Canadian Mead-Morrison Co.

Carries (Gravity):
Jones & Glassco, Reg.

Car Wheels and Axles:
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
John J. Garthshore.
Peacock Brothers, Limited.
Powley & Moody, Limited.
The William Kennedy & Sons, Ltd.

Cast Steel Gears:
Canada Foundries, Ltd.
The William Kennedy & Sons, Ltd.

Castings (Iron and Steel):
Herbert, Alfred, Limited.
Holman, Bros., Ltd.
Peacock Brothers, Limited.
The William Kennedy & Sons, Ltd

Cement Machinery:
Hadfields, Limited.
Hull Iron & Steel Foundries, Ltd.
The William Kennedy & Sons, Ltd.

Chains:
Dodge Manufacturing Co.
Jones & Glassco, Reg.
Canadian Link-Belt Co., Ltd.
Greening, B. Wire Co., Ltd.
Powley & Moody, Limited.

Chain Drives:
Jones & Glassco (Regd).
Powley & Moody, Limited.

Chain Drives — Silent & Steel Roller:
Link-Belt Limited.
Hans Renold of Can., Ltd.
Jones & Glassco (Regd.).

Chemist:
Thos. Heyes & Sons.
Milton Hersey Co.
Ledoux & Co.

Classifiers:
The Dorr Company.

Clutches:
Link-Belt Limited.
Hans Renold of Can., Ltd.

Coal:
Dominion Coal Co.
Nova Scotia Steel & Coal Co.

Coal Cutters — Coal Pick Machines:
Sullivan Machinery Co.
Canadian Ingersoll-Rand Co., Ltd.
Hebert, Alfred, Limited.
Holman Bros., Ltd.
Peacock Brothers, Limited.

Coal Crushers & Conveyors:
Link-Belt Limited.
Peacock Brothers, Limited.

Coal Mining Machinery:
Canadian Ingersoll-Rand Co., Ltd
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co. Ltd
Hadfields, Limited.
Hendrick Mfg. Co.
Hebert, Alfred, Limited.
Holman Bros. Ltd
Powley & Moody, Limited.
Sullivan Machinery Co.

Coal Screening Plants:
Link-Belt Limited.
Canadian Mead-Morrison Co.

Cobalt Oxide:
Deloro Smelting & Refining Co., Ltd

Compressers — Air:
Belliss & Morcom, Ltd.
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Denver Rock Drill Mfg. Co.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Laurie & Lamb.
Smart-Turner Machine Co.
Peacock Brothers, Limited.

Concentrating Tables:
Herbert, Alfred, Limited.
Holman Bros., Ltd.
The Mine & Smelter Supply Co

Concrete Mixers:
Canadian Fairbanks-Morse Co., Ltd
Gould, Shapely & Muir Co., Ltd.

Condensers:
Canadian Ingersoll-Rand Co. Ltd.
Belliss & Morcom, Ltd.
Laurie & Lamb.
Peacock Brothers, Ltd.

Condensers — Electrical Static & Power:
Griswold & Co.

Consulters and Engineers:
Milton Hersey Co., Ltd.

Conveyors:
Link-Belt Limited.
Canadian Mead-Morrison Co.
Jones & Glassco (Regd.).

Conveyor Belts:
Canadian Fairbanks-Morse Co., Ltd.
Gutta Percha and Rubber, Ltd.

Conveyor Flights:
Hendrick Manufacturing Co.

Conveyor — Trough — Belt:
Dodge Manufacturing Co.
Link-Belt Limited.
Hendrick Mfg. Co.
Jones & Glassco, Regd.

Copper:—
Consolidated Mining & Smelting Co.

Countershaft Fixtures:
Dodge Manufacturing Co.

Couplings:
Dodge Manufacturing Co.
Hans Renold of Can., Ltd.

Cranes:
Link-Belt Limited.
Canadian Mead-Morrison Co.
Peacock Brothers, Limited.

Crane Ropes:
Allan Whyte & Co.
Canada Wire & Cable Co.
Greening B., Wire Co., Ltd.

Crucibles:
The Mine & Smelter Supply Co.

Crusher Balls:
Canada Foundries & Forgings, Ltd.
Herbert, Alfred, Limited.
Holman, Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
Peacock Brothers, Limited.
The William Kennedy & Sons, Ltd.

Crusher Jaws:
Canadian Steel Foundries, Ltd.
The William Kennedy & Sons, Ltd.

Crushing Rolls:
Canadian Steel Foundries, Ltd.
The William Kennedy & Sons, Ltd.

Crushers — Jaw & Gyratory:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
Lymans, Limited.
The Mine & Smelter Supply Co.
Hadfields, Limited.

Cut Gears:
Hans Renold of Can., Ltd.
Jones & Glassco, Regd.
The William Kennedy & Sons, Ltd.

Cyanide:

Cyanide Plant Equipment:
The Dorr Co.
The Mine & Smelter Supply Co.

Diamond Drill Contractors:
Sullivan Machinery Co.

Diesel Engines:
Belliss & Morcom, Ltd.
Canadian Fairbanks-Morse Co., Ltd.
Laurie & Lamb.
Lammers & Maase, Ltd.

Dies:
Canada Foundries & Forgings, Ltd.
Herbert, Alfred, Limited.
Hull Iron & Steel Foundries, Ltd.
Holman Bros., Ltd.

Dredging Ropes:
Allan Whyte & Co.
Greening, B. Wire Co., Ltd.

Dredges:
Canadian Mead-Morrison Co.

Dredger Pins:
Hull Iron & Steel Foundries, Ltd.

Dredging Machinery:
Hadfields, Limited.
Hull Iron & Steel Foundries, Ltd.

Drills — Air and Hammer:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Herbert, Alfred, Ltd.
Holman Bros., Ltd.
Sullivan Machinery Co.
The Mine & Smelter Supply Co.

Drills — Core:
Canadian Ingersoll-Rand Co., Ltd.
Herbert, Alfred, Limited
Holman Bros., Ltd.
Sullivan Machineery Co.

Drill Steel Furnaces:
Canadian Ingersoll-Rand Co., Ltd.
Denver Rock Drill Mfg. Co.
Herbert, Alfred, Limited
Holman Bros., Ltd.
Sullivan Machinery Co.

Drills — Diamond:
Sullivan Machinery Co.

Drill Steel — Mining:
Canadian Ingersoll-Rand Co., Ltd.
Hadfields, Limited
Mussens, Limited

Drill Steel Sharpeners:
Canadian Ingersoll-Rand Co., Ltd.

Drills — Electric:
Canadian Fairbanks-Morse Co., Ltd
Herbert, Alfred, Limited
Holman Bros. Ltd.
Sullivan Machinery Co.
Northern Electric Co., Ltd.

Drills — High Speed and Carbon:
Canadian Fairbanks-Morse Co., Ltd
Hadfields, Limited
Herbert, Alfred, Limited
Holman Bros, Ltd.

Ejectors:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd.

Electric Condensers:
Griswold & Co.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd
Herbert, Alfred, Limited
Holman Bros., Limited
Northern Canada Supply Co

Electric Hoists:
Canadian Fairbanks-Morse Co., Ltd
Canadian Mead-Morrison Co.

Elevators:
Dodge Manufacturing Co.
Canadian Machinery Co.
Sullivan Machinery Co.
Link-Belt Limited.
Northern Canada Supply Co.
Hadfields, Limited.
Jones & Glassco (Regd.).

Engineering & Surveying Instruments:
Laurie & Lamb.

Engines — Ventilating:
Canadian Sirocco Co., Ltd

Engines, Diesel:
Canadian Fairbanks-Morse Co., Ltd.
Bellis & Morcom Ltd.
Laurie & Lamb
Lammers & Maase, Ltd.

Engines — Gas and Gasoline:
Canadian Fairbanks-Morse Co., Ltd
Belliss & Morcom, Ltd.
Sullivan Machinery Co.
Gould, Shapely & Muir Co., Ltd.
Laurie & Lamb.
The Mine & Smelter Supply Co
Powley & Moody, Limited.

Engines — Haulage:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd.
Powley & Moody, Limited.

Engines — Steam:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Laurie & Lamb

Engineers:
Dresser, John A.
Dorr Co.
Ferrier, W. F.
Hore, R. E.
Heves & Sons, Thos.
Hersey Co. Ltd., Milton
McEvoy, James C.
Rogers, George R.
Ross, Jas. G.
Stewart, Robert H.
Tyrell, J. B.
Whitman, Alfred B.
Wilson, Ridgeway R.

Exhauster:
Canadian Sirocco, Ltd.

Ferro-Alloys (all Classes):
Canadian Steel Foundries, Ltd

Fire Fighting Supplies:
Canadian Fairbanks-Morse Co., Ltd.
Gutta Percha & Rubber, Ltd.

Flood Lamps:
Northern Electric Co., Ltd.

Flotation Oil:
Hercules Powder Co.

Fluorspar:
Consolidated Mining & Smelting Co.
Everitt & Co.

Forging:
Canada Foundry & Forging, Ltd.
Herbert, Alfred, Limited
Holman Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
Smart-Turner Machine Co.

Friction Clutches:
Canadian Fairbanks-Morse Co., Ltd.
Dodge Manufacturing Co.

Frogs: — See Switches & Turntables
Canadian Steel Foundries, Ltd.
Hull Iron & Steel Foundries.
John J. Gartshore.

Furnaces — Assay:
Lymans, Limited.
Mine & Smelter Supply Co.

Gasoline Extraction Compressors:
Canadian Ingersoll-Rand Co., Ltd.
Sullivan Machinery Co.

Gasoline Tanks — See Tanks:
Can. Chicago Bridge & Iron Co., Ltd
Horton Steel Works, Ltd.
Hendrick Manufacturing Co.

Gaskets:
Gutta Percha & Rubber, Ltd.

Gears:
Hans Renold of Canada, Ltd.
Jones & Glassco, Regd.
The William Kennedy & Sons, Ltd.

Gears (Cast):
Link-Belt Limited.
The William Kennedy & Sons, Ltd
Hull Iron & Steel Foundries, Ltd.

Gears: Machine Cut:
The Hamilton Gear & Machine Co.
The William Kennedy & Sons, Ltd.

Gold Refiners:
Goldsmith Bros.

Gold Pans:
Can. Chi. Bridge & Iron Works, Ltd.
Horton Steel Works, Ltd.

Grab-Buckets:
Canadian Mead-Morrison Co.

Hangers:
Canadian Fairbanks-Morse Co., Ltd.
Dodge Manufacturing Co.

Hose:
Canadian Fairbanks-Morse Co., Ltd.
Goodyear Tire & Rubber Co.
Gutta Percha & Rubber, Ltd.
Dunlop Tire & Rubber Co.

Hangers and Cables:
Stan. Underground Cable Co., Ltd.

Heating Systems:
Canadian Sirocco Co., Ltd.

High Speed Steel:
Hadfields, Ltd

Hoists — Air, Electric and Steam:
Canadian Ingersoll-Rand Co., Ltd.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Dodge Manufacturing Co.
Herbert, Alfred, Ltd.
Holman Bros., Ltd.
Jones & Glassco, Regd.
Mine & Smelter Supply Co.
Link-Belt Limited.
Peacock Bros., Ltd.
Sullivan Machinery Co.

Hoisting Towers:
Canadian Mead-Morrison Co

Hoppers:
Dodge Manufacturing Co.

Hydraulic Machinery:
Hadfields, Ltd.
Belliss & Morcom, Ltd.
Laurie & Lamb.
The William Kennedy & Sons, Ltd.

Industrial Chemists & Inspectors:
Hersey, M. & Co., Ltd.

Insulating Compounds:
Standard Underground Cable Co.

Jacks:
Canadian Fairbanks-Morse Co., Ltd.
Northern Canada Supply Co.

Jaw & Gyratory Crushers, See Crushers:

Lamp-Miners:
Northern Electric Co.
Peacock Bros., Ltd.
Powley & Moody, Limited.

Lead (Pig):
Consolidated Mining & Smelting Co.

Link Belt — See Chain Drives:

Locomotives (Steam Compressed Air and Storage):
Canadian Ingersoll-Rand Co., Ltd.
Laurie & Lamb.
Powley & Moody, Limited.

Machine Guards:
Greening, B. Wire Co., Ltd.

Magnesium Metal:
Hull Iron & Steel Foundries, Ltd.

Manganese Steel, See Steel, Manganese:
Canadian Steel Foundries, Ltd.
Hadfields, Ltd.

Metal Merchants:
Consolidated Mining & Smelting Co
C. L. Constant Co.

Metallurgical Engineers:
The Dorr Co.

Metallurgical Machinery:
Dwight & Lloyd Sintering Co
The Dorr Co.
The Mine & Smelter Supply Co

Metal Work, Heavy Plates:
Can. Chicago Bridge & Iron Co., Ltd.
Horton Steel Works, Ltd.
Hendrick Manufacturing Co.
The William Kennedy & Sons, Ltd
Powley & Moody, Limited.

Mica:
Everitt & Co.

Mine Cars — See Cars, Mine:
The William Kennedy & Sons, Ltd.
Powley & Moody, Limited.

Mining Engineers:
Hersey, M. & Co., Ltd.

Mining Requisites:
Dominion Wire Rope Co., Ltd.
Hadfields, Limited.
Hull Iron & Steel Foundries, Ltd
Powley & Moody, Limited.

Mining Ropes — See Cable:

Mine Surveying Instruments:
C. L. Berger & Sons.

Molybdenite:
Everitt & Co.

Motors:
Canadian Fairbanks-Morse Co., Ltd.
Peacock Brothers, Ltd.
Powley & Moody, Limited.

Motor Pulleys:
Canadian Fairbanks-Morse Co., Ltd.
Dodge Manufacturing Co.

Nickel:
The Mond Nickel Co., Ltd.

Oil Engines — Reverse:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd.

Oil Storage Tanks — See Tanks:
Can. Chicago Bridge & Iron Co., Ltd
Horton Steel Works, Ltd.
Hendrick Manufacturing Co.
The Toronto Iron Works, Ltd

Ore Handling Equipment:
Link-Belt Limited.
Canadian Mead-Morrison Co.
Herbert, Alfred, Limited.

Ore Sacks:
Northern Canada Supply Co

Ore Testing Works: See Assayers & Chemists:

Ores & Metals—Buyers & Sellers of:
Geo. G. Blackwell.
Consolidated Mining & Smelting Co
Everitt & Co.

Oils:
Hercules Powder Co.

Pavers:
Wettlaufers Brothers.
Gutta Percha & Rubber, Ltd
Laurie & Lamb

Perforated Metals:
Hendrick Mfg. Co.
Canada Wire & Iron Goods Co
Greening, B. Wire Co.

Pillow Blocks:
Canadian Fairbanks-Morse Co., Ltd
Canadian Link-Belt Co., Ltd

Pipes:
Canadian Fairbanks-Morse Co., Ltd
Consolidated Mining & Smelting Co
The William Kennedy & Sons, Ltd.

Pipe — Wood Stave:
Pacific Coast Pipe Co.
Mine & Smelter Supply Co.
Canadian Ingersoll-Rand Co., Ltd

Piston Rock Drill—see Drills, Air & Hammer:

Plate Works:
Can. Chi. Bridge & Iron Co., Ltd
Hendrick Mfg. Co.
The William Kennedy & Sons, Ltd
Horton Steel Works, Ltd.

Platinum Refiners:
Goldsmith Brothers.

Pneumatic Tools:
Canadian Ingersoll-Rand Co., Ltd
Herbert, Alfred, Limited.
Holman Bros., Ltd.

Portable Column Hoists: see
Canadian Ingersoll-Rand Co., Ltd
Denver Rock Drill Mfg. Co
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Sullivan Machinery Co.

Poultry Netting:
Greening, B. Wire Co., Ltd

Power Factor Correcting Devices:
Bruswell & Co.

Power Condensers:
Bruswell & Co.

Prospecting Mills & Machinery:
Mine & Smelter Supply Co

Pulleys Shafting and Hangers:
Canadian Fairbanks-Morse Co., Ltd.
Dodge Manufacturing Co.
The William Kennedy & Sons Ltd

Pulleys — Iron, Steel, Wood Split:
Dodge Manufacturing Co.
Canadian Fairbanks-Morse Co., Ltd.

Pulverizers — Laboratory:
Herbert, Alfred, Limited
Holman Bros., Ltd.
Mine & Smelter Supply Co

Pumps — Pneumatic:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd
Smart-Turner Machine Co
Sullivan Machinery Co.

Pumps — Steam:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd
Northern Canada Supply Co
Peacock Brothers, Ltd.
Smart-Turner Machine Co

Pumps-Turbines:
Canadian Fairbanks-Morse Co., Ltd
Smart-Turner Machine Co.
Canadian Ingersoll-Rand Co. Ltd
Laurie & Lamb.
Peacock Brothers, Ltd.

Pumps-Vacuum:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co. Ltd
Smart-Turner Machine Co
Peacock Brothers, Ltd.

Pumps — Boiler Feed:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd
Peacock Brothers, Ltd

Pumps — Centrifugal:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd
Laurie & Lamb.
Peacock Brothers, Limited
Smart-Turner Machine Co.

Pumps — Diaphragm:
Canadian Fairbanks-Morse Co., Ltd
The Dorr Company.
The William Kennedy & Sons, Ltd

Pumps — Electric:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd
Laurie & Lamb.
Peacock Brothers, Ltd
Smart Turner Machine Co

Pumps — Sand & Slime:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd
Laurie & Lamb.
Mine & Smelter Supply Co
Sylvester Mfg. Co., Ltd.

Pumps — Valves:
Canadian Fairbanks-Morse Co., Ltd
Peacock Brothers, Ltd

Push Cars — See Cars, Push:
Canadian Fairbanks-Morse Co., Ltd
Powley & Moody, Limited

arrying Machinery:
Canadian Ingersoll-Rand Co., Ltd.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Sullivan Machinery Co.

ills:
Dodge Manufacturing Co.

ils:
Canadian Fairbanks-Morse Co., Ltd.
Hadfields, Limited.
John J. Gartshore.
Powley & Moody, Limited.

finers:
Goldsmith Brothers

ddles:
Hendrick Mfg. Co.

d Mills:
Mine & Smelter Supply Co.

ll Shells:
The William Kennedy & Sons, Ltd.
Canadian Steel Foundries, Ltd.

lls — Crushing:
Canadian Ingersoll-Rand Co., Ltd.
Hadfields, Limited.
Hull Iron & Steel Foundries, Ltd.
Herbert, Alfred, Ltd.
Holman Bros. Ltd.
Wettlaufer Bros.

ller Chain:
Hans Renold of Canada, Ltd.
Link-Belt Limited.
Jones & Glassco, Regd.

pe — Manilla & Jute:
Dodge Manufacturing Co.
Jones & Glassco, Regd.
Allan, Whyte & Co.

pe — Wire:
Canadian Fairbanks-Morse Co., Ltd.
Anglo Canadian Wire Rope Co.
Allan, Whyte & Co., Ltd.
Canada Wire & Cable Co.
Canada Wire & Iron Goods Co.
Dodge Manufacturing Co.
Dominion Wire Rope Co., Ltd.
Greening, B. Wire Co.

pe Transmission Equipment:
Dodge Manufacturing Co.

ine Refiners:
Goldsmith Brothers.

mplers:
Canada Metal Co.
Ledoux & Co.
Milton Hersey Co.
Thos. Heyes & Son.
Mine & Smelter Supply Co.

reens:
Canadian Ingersoll-Rand Co., Ltd.
Greening, B. Wire Co.
Hendrick Mfg. Co.
Canada Wire & Iron Goods Co.

reens — Cross Patent Flanged Lip:
Hendrick Mfg. Co.

reens — Perforated Metal:
Hendrick Mfg. Co.

reens Shaking:
Link-Belt Limited.
Hendrick Mfg. Co.

reens — Revolving:
Link-Belt Limited.
Hendrick Mfg. Co.
The William Kennedy & Sons, Ltd.

parators:
Smart-Turner Machine Co.
Mine & Smelter Supply Co.

er Pipes:
Wettlaufer Bros.

afting:
Canadian Fairbanks-Morse Co., Ltd.
Dodge Manufacturing Co.

heet Metal Work:
Hendrick Mfg. Co.

heaves:
Dodge Manufacturing Co.

heets — Genuine Manganese Bronze:
Hendrick Mfg. Co.

heets and Dies:
Hull Iron & Steel Foundries, Ltd
Peacock Brothers, Ltd.
The William Kennedy & Sons, Ltd.

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Canada Foundries & Forgings.

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Dodge Manufacturing Co.

intering:
Dwight & Lloyd Sintering Co., Inc

melters:
Goldsmith Bros.

moke Stacks:
Can. Chicago Bridge & Iron Co., Ltd
Horton Steel Works, Ltd.
Hendrick Mfg. Co.
The William Kennedy & Sons, Ltd

Special Machinery:

Spelter:
The William Kennedy & Sons, Ltd.
Consolidated Mining & Smelting Co.

Sprockets:
Canadian Fairbanks-Morse Co., Ltd.
Hans Renold of Canada, Ltd.
Canadian Fairbanks Morse Co., Ltd.
Dodge Manufacturing Co.
Link-Belt Limited.
Jones & Glassco, Regd.
The William Kennedy & Sons, Ltd.

Spring Coil & Clips Electric:
Canadian Steel Foundries, Ltd.

Stamp Batteries:
Herbert, Alfred, Limited.
Holman Bros., Ltd.

Stamp Forgings:
Canada Foundries & Forgings, Ltd
Hull Iron & Steel Foundries.

Steel Barrels:
Smart-Turner Machine Co.

Steel Castings:
Canadian Steel Foundries, Ltd.
Canadian Brakeshoe Co., Ltd.
Hull Iron & Steel Foundries, Ltd.
Hadfields, Ltd.
The William Kennedy & Sons, Ltd.
Denver Rock Drill Mfg. Co., Ltd.
Sullivan Machinery Co.
Peacock Brothers Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Canadian Mead-Morrison Co.

Steam Hoisting Engines:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Mead-Morrison Co.

Steel Drums:
Smart-Turner Machine Co.

Steel Manganese:
Hadfields Ltd.
Hull Iron & Steel Foundries Ltd.
Canadian Steel Foundries, Ltd.

Steel Plate Construction — Light and Heavy:
Hendrick Mfg. Co.
The William Kennedy & Sons, Ltd.

Steam Engines — See Engines Steam:

Steam Traps:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Sirocco Co., Ltd.
Laurie & Lamb.

Steel-Tool:
N. S. Steel & Coal Co.
Hadfields, Limited.

Stone Breakers:
Holman Brothers, Ltd.
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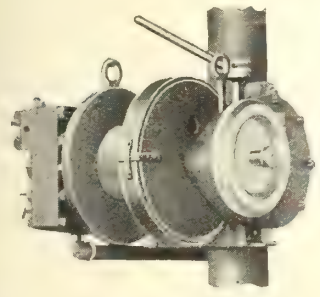

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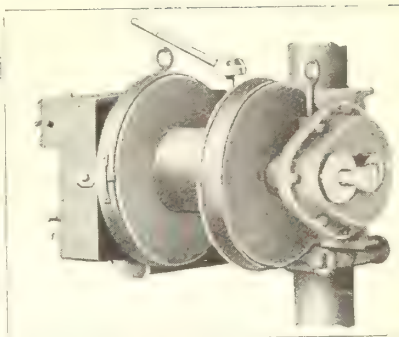

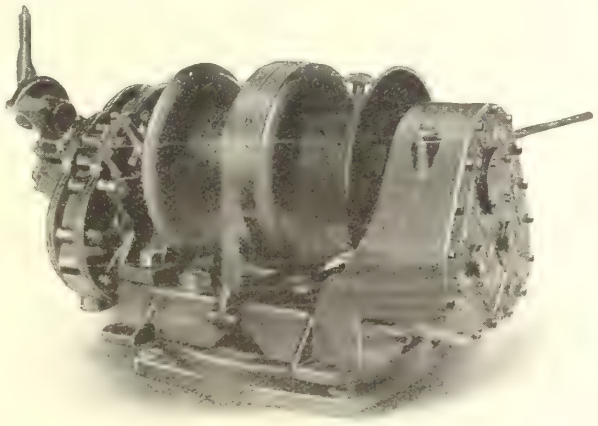

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COLUMN-HOIST work requires only a single-harness machine of either 3 or 5-HP. while slushing or scraper-mining necessitates a double-harness machine of sometimes 10-HP.

WHETHER your problem involves either single or double-harness, it can be solved to your complete satisfaction by one of these three well known hoists: Model 3—3-HP. Leadville; Model 5—5½-HP. Super-Leadville; or Model 300—10-HP. double-drum Turbro Waughoist.

LEADVILLES, (manufactured by THE William A. Box Iron Works Company, of Denver, Colorado), are now sold exclusively by this company in connection with its Turbro Waughoists. Write today to the nearest Waugh branch office for descriptive booklets.

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Sheriff's Sale

Of Valuable Mining Property
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TO WIT:

By virtue of a Writ of Fieri facias issued out of the Supreme Court of Ontario to me directed and delivered against the goods and chattels, lands and tenements of J. A. Seybold, defendant arising out of the suit of L. P. Hughes, administrator of the estate of A. M. Chisholm, vs J. A. Seybold, I will offer for sale by tender en bloc or separately all the mining interests in the North Half of Lot Number Five (5) in the Fourteenth Concession of the Township of Sheffield containing one hundred acres more or less known as Chisholm's Mine and also a quantity of heavy mining machinery consisting of rolls and flotation table.

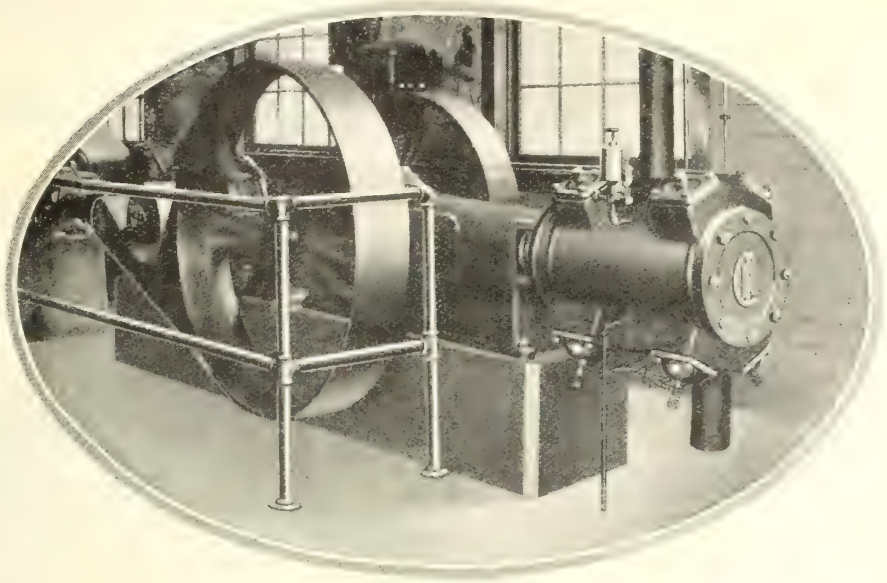
On the property is a blacksmith shop, large building for processing and other buildings.

The ore is said to be molybdenite ore and other valuable minerals.

Tenders will be opened at my office at the Court House in the Town of Napanee on Thursday December 28th, 1923 at 2 o'clock P. M. Each tender must be accompanied by a certified cheque for ten percent of the sum tendered which will be returned to the tenderer in case his offer is not accepted. The highest or any tender not necessarily accepted. Envelopes to be marked 'Tenders for Mine.'

C. W. VANDERVOORT

Sheriff



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Efficient because the lower the cost of compressing r, the greater the saving at the time when funds are ost badly needed and hardest to get.

Reliable because the property is often miles from a ilroad; there is usually only one compressor and if it reaks down work will be held up until repairs can be mpleted.

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For the small mine or quarry there is no simpler or better combination than an "Ingersoll-Rand" Class ER or FR Compressor and Ingersoll-Rand "Jackhamers" or Convertible Drifters and Sinkers.

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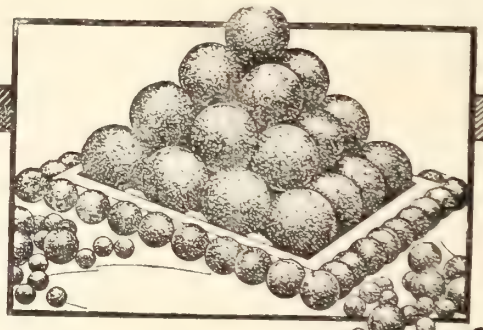

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Ontario's Minerals

PROVINCE OF ONTARIO

Hon. CHARLES. McCREA, Minister. DEPARTMENT OF MINES *Thos. W. Gibson*

Mineral Areas

Ontario, with its 407,262 square miles, contains many millions of acres in which the geological formations are favourable for the occurrence of minerals 70 per cent of the area being underlain by rocks of pre-Cambrian age. The phenomenally rich silver veins of Cobalt, Gowganda and South Lorrain occur in these rocks; so also do the far-famed nickel-copper deposits of Sudbury, the gold of Porcupine and Kirkland Lake, and the iron ore of Magpie and Moose Mountain mines.

Economic Minerals

In addition to the above, practically all economic minerals (coal and tin excepted) are found in Ontario: — actinolite, apatite, arsenic, asbestos, cobalt, corundum, feldspar, fluorspar, graphite, gypsum, iron pyrites, lead, mica, molybdenite, natural gas, palladium, petroleum, platinum, quartz, salt, talc and zinc. This Province has the largest deposits on the continent of talc, feldspar, mica and graphite.

Building materials, such as ornamental marble, limestone, sandstone, granite, trap, sand and gravel, lime, Portland cement, brick and tile, meet every demand.

Mineral Production

Preliminary returns show the output of the mines and metallurgical works of the Province for the year 1922 to be worth $62,202,169, of which the metallic production was $38,190,711.

The following figures show the growth of Ontario's mineral industry by five-year periods since 1891 when a Bureau of Mines was first established.

Year.	Value.	Year.	Value.
1891	$4,705,672	1911	$41,976,797
1896	5,235,003	1916	65,303,822
1901	11,831,086	1918 (Maximum war output)	80,308,972
1906	22,388,383	1921	48,128,387
	Dividends.		

Dividends and bonuses paid to the end of 1922 amounted to $28,096,699 for gold mining companies, and $86,238,185 for silver mining companies or a total of $114,334,884.

Mining Regulations

A miner's license costs $5.00 per annum, and entitles the holder to stake out in any or every mining division three claims of 40 acres each. After performing 200 days' assessment work on a claim, patent may be obtained from the Crown on payment of $2.50 or $3.00 per acre, depending on location in unsurveyed or surveyed territory.

Assay Office

The Provincial Assays Office at No. 5 Queen's Park, Toronto, is maintained by the Department of Mines for the free identification of minerals, free assays under the provisions of the Mining Act of Ontario, and also for general assay work as per the Schedule of Charges which may be obtained on application.

Temiskaming Testing Laboratories

The Department maintains, at Cobalt, an ore sampling and testing laboratory which is now prepared to receive parcels of gold ore from 100 pounds upward, and after sampling and assaying the same to pay to the shipper the value thereof, less treatment charges. The purpose is to afford a market for ores extracted by prospectors and others in developing their mining claims, enabling them to obtain funds which they can use for further work and to report on the most satisfactory method of treatment. Fuller information may be obtained on application to the Manager, Temiskaming Testing Laboratories, Cobalt, Ontario.

Publications

For list of publications, illustrated reports, geological maps and mining laws, apply to

Thos. W. Gibson,
Deputy Minister of Mines.
TORONTO, CANADA

BRITISH COLUMBIA

The Mineral Province of Western Canada

Has produced Minerals valued as follows: Placer Gold, $76,542,203; Lode Gold, $109,647,661; Silver, $59,814,266; Lead, $51,810,891; Copper, $170,723,242; Zinc, $24,625,853; Coal and Coke, $238,289,565; Building Stone, Brick Cement, etc., $36,605,942; Miscellaneous Minerals, $1,358,839; Making its mineral production to the end of 1922 show an

Aggregate Value of $769,418,462

The substantial progress of the Mining Industry of this Province is strikingly exhibited in the following figures, which show the value of production for successive five-year periods: For all years to 1895, inclusive $94,547,241; for five years, 1896-1900, $57,607,967; for five years, 1901-1905, $96,509,968; for five years, 1906-1910, $125,534,474; for five years, 1911-1915, $142,072,603; for 5 years, 1915-1920, $189,922,725; 1921, $28,066,641; for the year 1922, $35,158,843.

Production During last ten years, $339,280,940

Lode-mining has only been in progress for about twenty-five years, and not 20 per cent. of the Province has been even prospected; 300,000 square miles of unexplored mineral bearing land are open for prospecting.

The Mining Laws of this Province are more liberal and the fees lower than those of any other Provi[illegible] in the Dominion, or any Colony in the British Empire.

Mineral locations are granted to discoverers for nominal fees.

Absolute Titles are obtained by developing such properties, the security of which is guaranteed by Crown Grants.

Full information, together with Mining Reports and Maps, may be obtained gratis by addressing.

VICTORIA, British Columbia

THE HON. THE MINISTER OF MINES

PROVINCE OF QUEBEC

MINES BRANCH

Department of Colonization, Mines and Fisheries

The chief minerals of the Province of Quebec are Asbestos, Chromite, Copper, Iron, Gold, Molybdenite, Phosphate, Mica, Graphite, Ornamental and Building Stone, Clays, etc.

The Mining Law gives absolute security of Title and is very favourable to the Prospector.

MINER'S CERTIFICATES. First of all, obtain a miner's certificate, from the Department in Quebec or from the nearest agent. The price of this certificate is $10 and is valid until the first of January following. This certificate gives the right to prospect on public lands and on private lands, on which the mineral rights belong to the Crown.

The holder of the certificate may stake mining claims to the extent of 200 acres.

WORKING CONDITIONS. During the first six months following the staking of the claim, work on it must be performed to the extent of at least twenty-five days of eight hours.

SIX MONTHS AFTER STAKING. At the expiration of six months from the date of the staking, the prospector, to retain his rights, must take out a mining license.

MINING LICENSE. The mining license may cover 40 to 200 acres in unsurveyed territory. The price of this license is Fifty Cents an acre per year, and a fee of $10.00 on issue. It is valid for one year and is renewable on the same terms, on producing an affidavit that during the year work has been performed to the extent of at least twenty-five days' labour on each forty acres.

MINING CONCESSION. Notwithstanding the above, a mining concession may be acquired at any time at the rate of $5 an acre for SUPERIOR METALS, and $3 an acre for INFERIOR MINERALS.

The attention of prospectors is especially called to the territory in the Northwestern part of the Province of Quebec north of the height of land, where important mineralized belts are known to exist.

PROVINCIAL LABORATORY. Special arrangements have been made with POLYTECHNIC SCHOOL of LAVAL UNIVERSITY, 228 ST. DENIS STREET, Montreal, for the determination, assays and analyses of minerals at very reduced rates for the benefit of miners and prospectors in the Province of Quebec. The well equipped laboratories of this Institution and its trained chemists ensure results of undoubted integrity and reliability.

The bureau of Mines at Quebec will give all the information desired in connection with the mines and mineral resources of the Province, on application addressed to

HONORABLE J. E. PERRAULT,

MINISTER OF COLONIZATION, MINES AND FISHERIES, QUEBEC

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CANADIAN MINING JOURNAL

PUBLISHED WEEKLY

Devoted to the Science and Practice of Mining, Metallurgy and the Allied Industries; and more particularly to their progress in Canada

VOL. XLIV. Gardenvale, Que., November 30th, 1923 No. 48

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The Editor cordially invites readers to submit articles of practical interest which, on publication, will be paid for.

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Serving Canada's Mining Industry

It is many years since The Imperial Bank of Canada, recognizing the importance of the Canadian Mining Industry and realizing the need of banking facilities for those engaged in its development, first opened a branch in Northern Ontario.

Since then the Imperial Bank's service has gradually extended until the mining interests in the rich area between North Bay and Hearst are now linked up by a complete chain of 12 branches.

This Bank's service to the mining industry is not confined to Northern Ontario alone. In all the mining areas throughout Canada the "Imperial" is rendering a valuable and complete financial service.

IMPERIAL BANK OF CANADA

Peleg Howland, President. A. E. Phipps, General Manager

The Kromhout Gives Dependable Service Under The Most Exacting Conditions:

The following letter received from a famous Hudson's Bay Captain in reference to a 20 year old KROMHOUT engine, testifies to the fact that the KROMHOUT will stand abuse as well as use.

The steel motor vessel "NEOPHITE" was built in 1903, and installed with a 50 B.H.P. KROMHOUT Oil Engine. For ten years she was used in European waters, maintaining a freight service between Holland and England. In 1913 she came to Canada, crossing the Atlantic under her own power. She was sent to the Hudson's Bay by the Railways and Canals Department in 1913, and was used for lightering from the large ships at the Port Nelson terminals until 1917 being in continuous service.

During the period of her service in Hudson's Bay, the "NEOPHITE" was commanded by me and gave excellent service, the engine in particular being reliable and efficient, and giving no trouble; we never lost a tide, and the engine to my knowledge never refused duty.

I have no hesitation in recommending this type of engine to anyone requiring economical power for commercial vessels.

Yours faithfully,
MASTER.

We have a book full of similar testimonials from all parts of the world. Send for it if interested.

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Mr. John Lockhart,
837 Hastings St., W., VANCOUVER, B. C.

:-: EDITORIAL :-:

GOLD EMBARGO SUSPENDED

In the *Journal* of the 16th. inst. reference was made to the proposal of Hon. Mr. Fielding, Minister of Finance, to pay for Canadian gold in Canadian funds, while maintaining the embargo upon its export. This proposal never actually came into effect, and the story is an interesting one.

The objections to the course proposed were placed before the Minister of Finance by representatives of the gold-producing companies, but from the published accounts, it would appear these gentlemen received little comfort, the Minister remarking that the companies could better afford to lose the difference in exchange than could the Government. Never before in a British Dominion has so extraordinary an attempt at confiscation been made. To compel Canadian companies to sell their gold to the Canadian Government and take their pay in Canadian currency, depressed below par, while in the United States there was a ready market at $20.67 per ounce in American currency, was simply to rob the companies of the difference, for the Government could immediately ship to New York the gold they purchased and be paid for it in U. S. dollars. On last year's output the profit on the transaction would be over $400,000.

It is obvious that the Government proposal if put into effect, would strike a blow at the gold basis of our currency. In principle it would be equivalent to the German Government compelling gold mining companies in that country, if there were any, to hand over their product in return for German marks, the value of which at present is, say, one billion for a postage stamp. The great mines of the Rand in South Africa are permitted to sell their gold in London at the market rate, which depends upon the rise or fall of the pound Sterling. In 1920, the price of gold in London rose to 120 shillings per ounce, and the President of the Transvaal Chamber of Mines stated that, with working costs as they then stood, 16 mines at work would be making a loss when gold dropped to 100 shillings an ounce; when it dropped to 90 shillings per ounce, the number of mines affected would be increased to 26, and when gold returned to its normal price of 85 shillings, 31 mines would no longer pay for the working. The price of gold in London at the present time is about 92 shillings, but the predicted effects in the Transvaal have been to a large degree averted by reason of a reduction in working costs. Nevertheless, the margin in some mines is small. But neither the Government of the South African Union nor the British Government, notwithstanding the bitter taxation in England, ever attempted to lay hands on the margin between the price as measured by the depressed pound, and the price when sterling is at par. We hope Canadian currency will soon return to the par level; but if it should sink still further, the effect of any such move as Mr. Fielding proposed would be correspondingly injurious. In principle the suggestion was wrong; it would frighten capital, instil a lack of confidence in Canadian laws, and hold up the Canadian ideas of justice before the world as modelled on those of the Soviet Government of Russia.

On the return of the gold companies' representatives from Ottawa, Honourable Chas. McCrea, Minister of Mines for Ontario, telegraphed Mr. Fielding protesting strongly, and asking for an appointment. Mr. Fielding fixed Wednesday morning, 14th. November; and, accompanied by a large delegation, representing British, American and Canadian investors and producers, Mr. McCrea went to Ottawa, and all the above objections and others were plainly laid before Mr. Fielding. To his credit, be it said, Mr. Fielding saw the light, and the same day gave a statement to the press to the effect that the Government desired to take further time to consider the question of lifting the embargo, but that meanwhile "in cases arising, licenses to export bullion would be granted to the companies".

It is evident Honourable Howard Ferguson has a "live wire" in his Minister of Mines.

FORT NORMAN OIL FIELD

Last year Dr. George S. Hume, of the Geological Survey, contributed to these pages on his return from the field a summary account of his investigations in the Fort Norman oil area. Today we are pleased to present a resumé of what he has learned during the season just closed, and some of his conclusions. It will be noted that Dr. Hume suggests that the work of the Imperial Oil Company in that area has been suspended, not abandoned. His recommendations for more drilling serve to indicate that further investigation will be fruitful of at least important geological data.

It is a privilege to be able to present to our readers authoritative information such as this, almost or quite a year in advance of the official report. We feel that

the policy that not only allows but encourages the technical officers of the Department of Mines to present these advance reports for public use through the public press is worthy of the highest commendation.

BLANKETED GROUND IN THE GOLD BELT

The past season's activities in the western part of the Quebec gold belt has showed up a serious fault in the laws that govern staking and assessment work. At least eighty per cent. of the land held under prospectors' licenses or permits has been merely blanketed; that is, it has been held without the performance of any real prospecting work. On some of this land assessment work has been sworn to that was never performed; but the majority of the claims thus witheld from active development of any kind have been held by other means.

Under the present regulations, a claim can be held for six months without obligation other than buying a license, staking and recording. At the end of that time assessment work and a tax of fifty cents an acre are due. There is more than one way of circumventing these regulations. The past season's experience has shown that a common way is to "trade" claims. A few days before the assessment work and cash payment on two claims in separate localities are due to be recorded, the separate owners will post up notices of abandonment and each will re-stake the other's claim and record it — free from duties for another six months plus the allowance for winter weather. By this means much land witheld from active development during the season just closed will remain again during the summer of 1924 in the hands of speculators who have no intention of spending time, effort or money on their claims.

In spite of the unusually encouraging results of exploration in Rouyn and Boischatel townships during the past season, progress is sure to be retarded under the conditions induced by the present laws. There were not over a dozen and a half genuine prospecting parties at work consistently in these two hundred square miles during the past summer, and there was room for four or five times that number. Four-fifths of the land was held idle by speculators. Something should be done to rectify this.

RAILWAY CONSTRUCTION IN THE GOLD BELT

The new branch railway from Swastika eastward through Kirkland Lake to Larder Lake is progressing only slowly on account of some difficult cuts. However, the consensus of opinion seems to be that it will be in operation by the middle of next summer to Larder Lake. Meantime a large survey party has established a winter camp in Boischatel township in Quebec, a few miles east of the interprovincial boundary for the purpose of continuing the railway location eastward along the gold belt. Obviously it is the intention of the railway commissioners of the Ontario government to push the line eastward, under the warrant of their federal charter, as far and as fast as the development of new mines eastward along the belt will warrant it.

At the present terminus of active construction at Larder Lake the two mines of Associated Goldfields and Crown Reserve are progressing very satisfactorily and each has a force of about seventy-five men at work. The old Associated mill has been dismantled and the equipment and material have been moved up to a new mill-site near the new mine. There is not sufficient equipment for a complete mill, but it seems quite feasible to complete it and put it in operation without waiting for the railway to come through. It does not seem likely that the Crown Reserve will bring in material for a mill before the aid of the railway is available.

Before the railway is completed to Larder Lake underground work and diamond-drilling at Lake Fortune and the Noranda property will have showed whether or not these two will make mines. If the deposits show up underground as they do on the surface, the extension eastward of the railway will be well warranted, and no doubt it will be commenced immediately. There is a fairly easy avenue of approach to Lake Fortune from Larder, and beyond that the clay belt makes easy work for the locating engineer

Meantime there is a double inducement for the northward extension of the Canadian Pacific Railway branch from the Quinze dam, its present terminus. There is fine agricultural land all the way from there to the finds in Boischatel and Rouyn townships, in addition to the traffic that promises to develop from the prospective mines. The next year may see the two railways under construction to the heart of the Quebec gold belt and there appears to be sufficient reason for both.

SOUTHERN ALBERTA OIL PROSPECTS

Elsewhere in this issue we publish an interesting and instructive article on Oil Prospects in Southern Alberta by Dr. M. Y. Williams.

Dr. Williams and E. J. Whittaker commenced last summer for the Geological Survey a rather detailed and comprehensive geological investigation and mapping of the southern part of Alberta and adjacent parts of Saskatchewan and British Columbia between the international boundary and latitude 52 deg. Even with these two officers collaborating the field is so large that it will take one, if not two seasons, to com

plete and issue the map and full report. It has, therefore, appeared desirable to issue some interim statements such as the one we now publish, especially as a considerable amount of drilling for gas and oil was being carried on in the area last summer and may be continued next summer.

"THE PHILOSOPHY OF ROCK CRUSHING"

Professor N. E. T. Haultain Is In United States Lecturing On The Above At Several Colleges And Before Bodies Of Mining Engineers

At the request of the American Institute of Mining and Metallurgical Engineers, Prof. H. E. T. Haultain, head of the Department of Mining and Metallurgy in the Faculty of Applied Science and Engineering, University of Toronto, left on the 11th November to deliver a number of lectures in several colleges in the United States on the "Philosophy of Rock Crushing." Prof. Haultain has also been speaking before bodies of mining engineers and others, and has been getting great receptions.

Work Accomplished

With the assistance of Prof. F. C. Dyer of the Department of Mining Engineering and a number of graduate students, Prof. Haultain has, for the past three or four years, been making an intimate study of the tube mills used in rock and ore crushing operations. Through the use of specially constructed laboratory apparatus and the ultra-speed moving picture camera Prof. Haultain and his associates have been able to obtain valuable information concerning tube mills.

The American Institute of Mining and Metallurgical Engineers became interested in Prof. Haultain's work during a visit to Northern Ontario last summer, when they were shown a set of motion pictures made in the Department of Mining Engineering illustrating the movement of balls in a tube mill. In a letter to Hon. Charles McCrea, Minister of Mines for Ontario, the Secretary of the institute, F. F. Sharples of New York, expressed the opinion that the results of this work made one of the most valuable additions within recent years to technical knowledge of crushing machinery.

In Pittsburg Today

Later Mr. Sharples invited Prof. Haultain to deliver lectures on his researches under the auspices of the Institute. On receiving a favorable reply he made arrangements for meetings to be held at Ohio State University, Columbus, Ohio; the University of Pittsburg, Pittsburg, Pa; Pennsylvania State College, State College, Pa; Lafayette college, Easton, Pa; Lehigh University, Bethlehem, Pa; Columbia University, New York City; Yale University, New Haven, Conn., and the Massachusetts Institute of Technology, Cambridge, Mass. In Pittsburg where Prof. Haultain will speak today, addresses are to be given not only to the students of the University School of Mines, but to the students of the Carnegie Technical School, and a third meeting, composed of the Pittsburg section of the Institute and the Engineering Society of Western Pennsylvania.

Value of Camera

The investigations made on rock-crushing in the Department of Mining Engineering, instituted by Prof. Haultain, were first directed to the paths of balls in tube mills. The tube mills, in which all ore and cement is ground fine, consist of a large steel barrel from four to twenty feet long. They are half-filled with Danish pebbles, steel balls or steel rods, and the material is either wet or dry. The work was begun by taking a series of 500 still photographs and later the ultra speed moving picture camera was used, slowing the motion down one eighth on the screen. This produced excellent results.

Research work on the big machines, while still continued, was found difficult, and quantitative experiments were made with small laboratory apparatus, with more rapid results.

Further Tests Being Made

An elaborate series of tests are being made on the actual energy required for the crushing of different types of rock with a set of miniature rolls working in high-grade ball-bearing and connected with a sensitive integrating dynamometer. The necessary funds for this apparatus were provided by the Honorary Advisory Council on Scientific and Industrial Research, of Ottawa, special chrome steel and manganese steel rolls provided by Sir Arthur Hadfield made it possible to study the wear of these and other alloy steels.

The ultra-speed camera was also used to take photographs of the actual crushing of different varieties of rocks.

Prof. Haultain has had nearly 20 years' experience in mining in Europe, South Africa, the Western States, British Columbia and Ontario, previous to taking up academic work some years ago.

WASTE AND WANT

The terrific waste of the World War is largely responsible for high prices throughout the world, and want and starvation in many of its parts. Waste, no matter what its cause, in proportion to its amount, has the same effect upon general prices. It is estimated that the bituminous coal strike caused a loss of over $2,000,000,000 as a direct loss to the miner, operator, the railroads and the consumer. Whether this estimate is correct or not as to the direct loss there can be little question that the indirect loss to the nation is fully as great if not greater, than the loss to the parties who are directly concerned therein.

Wages are usually paid in money. Money is the medium of exchange. The value of the money received in wages to the wage earner depends entirely upon the amount of commodities which he can purchase therewith. If this loss is spread among the 100,000,000 people of the country, it will mean an average loss of $20 to each man, woman and child in the United States. If assumed by the coal miners themselves, it will be a loss of $2,600 to each individual coal miner.

In the end, the fact must be recognized that the more labor produces, the more it can have, and that higher wages, no matter how high, will be of no value to the wage earner, if production costs are increased in the same ratio that wages are increased. - Mining Congress Journal.

German Market For Canadian Minerals

An interesting article has been forwarded to the Trade Department at Ottawa on the German market for Canadian minerals by Trade Commissioner L. D. Wilgress from Hamburg, Germany. The cessation of the industrial boom and the decline in all forms of manufacturing activity caused a marked falling off this year in the importation of minerals into Germany, the report declares.

"The occupation of the Ruhr adversely affected the demand for raw materials by cutting off large consumers from their markets for finished products in occupied Germany. It had been expected that the general resumption of work in the Ruhr following upon the cessation of passive resistance would lead to a great demand for all kinds of raw materials, but the delay in arriving at a satisfactory basis of settlement is retarding business and the position remains very uncertain." The depreciation of exchange also made itself felt.

Refined Nickel

Out of a total import of refined nickel into Germany during the first six months of this year amounting to 895 tons, Canada is shown as having supplied 187 tons, Great Britain 331 tons, the United States 148 tons, and Belgium 134 tons. Consumption of nickel, however, was greatly reduced as a result of the Ruhr occupation and the general decline in business activity.

Canadian Asbestos Best Liked

At present the trade in asbestos is much restricted since most of the factories using asbestos are either closed down or working on short time. Some asbestos imports are sold to Austria, Hungary and Czecho-Slovakia, chiefly short fibred material for making shingles. The report continues:

"The asbestos consumed in Germany is chiefly long fibre stock for spinning purposes. Canadian asbestos is the best liked and realizes a higher price from other countries. Rhodesia is the next and most important source of supply, and although slightly harder and more brittle than Canadian, the asbestos from this source is in good demand. Russian asbestos has been imported during the past year by the Russian Government organization and regular shipments have been received during recent months."

Canada Far in Lead

Figures of asbestos imports into Germany from the leading sources of supply showing the first six months of 1923 and 1922, show that Canada this year supplied about 55 per cent., 1,699 tons out of 3,080 tons, while last year the Canadian shipments were 2,956 out of 5,198, a decrease this year of about 1,250 tons. The record is as follows:

Six mos. to June 30	1923	1922
Canada	1,688	2,956
Brit. S. Africa	397	822
United States	164	562
Switzerland	2	327
Other countries	818	631
Total tons	3,080	5,198

The increase in imports from "other countries" refers chiefly to Russian asbestos.

81,000 Tons Iron Ore

In the case of iron ore, Sweden supplies over nine times what Canada has done. For the first six months of this year the total imports of iron ore into Germany were 1,548,830 tons of which Sweden supplied 770,520 and Canada 81,514. During the same period last year imports were 2,150,061 tons. The revival of production in the Ruhr will result in large importations of iron ore starting again.

Coal Imports Now Down

The cutting off of supplies from the Ruhr has caused a considerable drop in imports of coal. For the first six months of this year England sent in 7,756,627 tons as compared with 1,526,581 tons for the same period in 1922. A fair amount of business has also been done in coal from the United States and Canada. Lately imports have fallen off owing to lessened industrial activity and shortage of working capital. Prices for English coal ranged around 13 shillings a ton at the port of Hamburg.

British Columbia Copper

The report states that it should be possible to dispose of British Columbia copper to Germany. Of a total importation of raw copper into Germany during the first six months of this year of 50,595 tons, the United States supplied 37,805 tons.

Germany has already been an important consumer of Canadian cobalt which is used to a large extent in the enamel, porcelain and glass industries and also as an alloy in the manufacture of steel.

German Mineral Imports

Following are German imports for first six months of 1923 as against same period in 1922:

Tons	1923	1922
Asbestos	3,080	5,196
Nickel ore	18	164
Raw nickel ore	859	1,165
Silver ore	.....	11
Copper ore	18,541	69,499
Raw copper	50,594	72,670
Iron ore	1,548,883	5,218,293
Graphite	7,975	8,754
Mica, raw	284	402
Molybdenum, etc.	466	792
Coal	15,062,542	2,102,215
Coke	460,581	51,568

INDIAN PIG IRON PRODUCED

A large unit in the Indian iron and steel industry reports its production of pig iron for the three-month period, April 1 to June 30, 1923, inclusive, as 95,750 tons, or 27,980 tons greater than that for the corresponding period in 1922. The output of finished iron for these same three months in 1923 amounted to 36,274 tons, compared with 31,470 tons last year.—U. S. Commerce Reports.

Recent Developments in the Fort Norman Oil Area*

By G. S. HUME

Since the Discovery well was "brought in" in the fall f 1920, fifty-three miles north of Fort Norman on the ast bank of the Mackenzie river, oil men interested in anada have watched keenly developments by the Imerial Oil Company in the far Northwest. The distance rom a source of supplies, combined with the problems f transportation during a comparatively short season f navigation on the northern rivers and lakes, greatly etarded test drilling that would give a basis for opinion n the possible production of oil from this sub-Arctic egion. To ensure the use of the good weather of the arly spring and late fall during which navigation was losed, the Imperial Oil Company left a number of men nder the supervision of driller Angus Sutherland to pend the winter of 1922-23 in the oil field and, due to heir energetic efforts, two wells, previously started, vere finished by the close of the 1923 season.

The 1923 Drilling Campaign

During 1922 "C" camp well on the west bank of the Mackenzie had been drilled to 1,700 feet; but, due to drilling difficulties, it was found impossible to continue his hole. Consequently the drilling rig was moved a short distance and a new hole put down. This new hole gives a fair test of its locality, and many will regret to know that no oil was encountered, although the hole penetrated through Upper Devonian and some distance into Middle Devonian strata. The hole, when drilling ceased, was dry. The other hole completed was on Bear Island, in the Mackenzie about two miles from the Discovery well. In this hole a showing of oil was obtained just above the contact between the Middle and Upper Devonian, but the flow was very small. As was pointed out in the Summary Report, G.S.C., Part B, 1922, page 62, oil in small quantities is to be expected at this horizon and the fact that the well at "C" camp produced neither oil nor water would seem to indicate a degree of cementation more complete than would be expected from studies made at the outcrop on the flank of the Norman range of mountains. In the Bear Island well drilling was carried a considerable distance into the Middle Devonian limestones and was abandoned only after a flow of salt water was struck.

Negative Results This Year

In former articles it has been pointed out that there are porous, brecciated limestones below the Ramparts limestone of Middle Devonian age. In various localities the rock of this porous horizon has a strong bituminous smell; but, as pointed out in the Summary Report already quoted, it seems probable that only under exceptional conditions could this horizon be oil-bearing. However, it is believed to be the container of the salt water struck in the Bear Island well. Thus the only two holes completed in 1923 have given negative results as far as the production of oil is concerned. Both these holes are located down the dip from Discovery or No. 1 well, so that the inference might be drawn that the oil is up the dip. In view of the fact that no water was encountered until well below what is considered as the probable productive horizons, the reason for such a condition seems somewhat obscure from data at hand.

Increased Production of Discovery Well

In an article in the *Canadian Mining Journal*, Dec. 1, 1922, page 816, it was pointed out that during work for the Geological Survey in 1922 a sandstone member 50 to 75 feet thick was found in the Fort Creek shales, this formation now giving the production in the Discovery or No. 1 well. It was thought that this was the "sand" from which the oil was derived. No confirmation of this has been obtained, and although Discovery well was cleaned out and deepened slightly this past summer, no evidence of sand such as might come from this sandstone member was found. It cannot, therefore, be known whether the sandstone member extends from the outcrop on Canyon creek to the Discovery well; but from present developments it would seem likely, from the depth to which drilling has been now carried, that if the sandstone member were present at this location the drill would already have penetrated it. On the other hand, the possible flow of oil from Discovery well in its present state is even greater than it was previously, perhaps as high as 100 barrels per day, and it seems difficult to account for such a flow from a shale unless some fairly coarse, porous member provided a reservoir. As has been already

The "Discovery well" of the Imperial Oil Co. Fort Norman, Mackenzie River District, N. W. T.
(The picture shows the well shooting oil during the attempt to deepen it Aug. 1923.)

shown elsewhere, such a sandstone lense would act as a suitable container for the oil and the pressure in the well which is as high as 250 lbs. per square inch, could thus be accounted for. The only alternative explanation which would account for the facts would be the presence of a minor fold superimposed on the main fold at the Discovery well location. No evidence from the outcrops could be obtained to [illegible] such a fold exist.

Geological Information Gained

The results of the drilling, although negative as far as the actual production of oil, is concerned, are nevertheless valuable from the standpoint of the information obtained. The thickest section of the Fort Creek for-

* Published with the permission of the Director, Geological Survey of Canada.

mation encountered was in "C" camp well. In it, about 1,050 feet below the Bosworth formation a considerable thickness of hard limestone was encountered. Below this again more black shale occurred above the typical Beavertail limestone. In the Bear Island well the thickness of Fort Creek Shale is considered to be 1,300 feet. An interesting feature of the "C" camp well is a much smaller thickness of Bosworth sandstones and shales than occurs at the outcrop of this formation in the Carcajou Mountains to the west, the difference in thickness being accounted for by the erosional unconformity separating the Devonian and Cretaceous. For this reason much more Cretaceous occurs at the location of "C" camp well than was formerly supposed; in fact it is believed the Cretaceous here forms a suitable cover for the retention of any oil in the Bosworth sands, a condition that was not formerly recognized for this location. As the Bosworth formation was considered to be the most favorable oil horizon on account of its porosity and due to the fact that most of the seepages originate from it on the east side of the Mackenzie, the results from "C" camp are not encouraging for further exploration of this formation down the dip. It is thought, however, that drilling sites located on suitable structures on the west side of the Mackenzie would have much better chances of obtaining oil from this formation.

More Drilling Recommended

While the results from these two wells are disappointing, they are not such as to warrant undue pessimism regarding the future of this field. The Discovery well has a stronger flow than ever before, and it is the history of every field that test holes must be put down to find the lateral extent of the oil-bearing horizons. From present information the conclusion might be drawn that the possible oil-producing area will be much more limited than at first thought; but until the conditions at Discovery well are better known it would be unsafe to make any predictions. It was the intention of Mr. Sutherland, the driller in charge of operations for the Imperial Oil Company in the Mackenzie area, to shut off the flow of oil in the Discovery well and put the hole down to the Beavertail limestone. An attempt was made to do this, but difficulties were encountered and the attempt had to be abandoned temporarily.

Surface exposures of rock are so few and scattered in the immediate vicinity of this well that no definite conclusions could be drawn from them regarding any possible local structure that might account for the flow of oil. It is to be hoped either that Discovery well will be deepened or that another hole will be put down close by, so that a satisfactory explanation can be given of the exact conditions under which the oil occurs. Such an explanation would go a long way towards determining the future of this field and would be invaluable in the selection of further drilling sites.

B. C. COAL OUTPUT FOR OCTOBER 1923

The coal production of the mines of the Province of B. C. during the month of October 1923, totals 228,293 tons, an increase over the month of September production of 46,659 tons.

Of the total production for the month the mines on Vancouver Island produced 143,020 tons approximately 63 per cent, and 21,140 tons over the production of last month.

The Nicola Princeton mines produced 22,232 tons which is an increase of 3,254 tons over last Month's production and approximately 10 per cent of the total production.

The Mines in the Crow's Nest Pass District produced 63,041 tons during October an increase of 22,265 tons over last month, and approximately 27 per cent, of the total production.

All the mines in the Province showed an increase over last month's production.

The following figures show the tonnages produced by the different Collieries.

Tonnages for October 1923.

	Tons	Tons
Canadian Collieries (D) Ltd.		
Comox Colliery	24,162	
Extension Colliery	17,946	
No. 5 South Wellington Colliery	6,691	
		48,79
Western Fuel Corporation of Canada		
No. 1 Mine	31,045	
Reserve Mine	18,157	
Wakesiah Mine	10,396	
		59,59
Other Collieries:		
Granby Con. M. S. & P. Co.	20,358	
Nanoose Wellington Company	9,306	
East Wellington Coal Company	3,758	
King & Foster	1,201	
		34,62
Total for Vancouver Island		143,020
Crow's Nest Pass District:		
Coal Creek Colliery	34,725	
Michel Colliery	23,840	
Corbin Colliery	4,476	
		63,04
Nicola Princeton District:		
Middlesboro Colliery	8,247	
Coalmont Colliery	12,022	
Princeton Colliery	1,963	
		22,23
Total for Province		228,29

BROKEN HILL PROPRIETARY

At the recent annual meeting of the Broken Hill Proprietary Company in Melbourne, Australia, it was stated that, since the mine dumps now being worked over were nearing the end, underground mining would be resumed shortly. There are 954,000 tons of ore reserves. The cost of mining will be heavy, as an arbitration award provides for only 27½ hours of work per week at the face and eliminates the night shift. The Company's principal operation now is the large steel works at Newcastle, New South Wales, where operations were resumed recently. In this case arbitration of disputed points failed of success, and it was a consultation of employers and workmen that finally resulted in renewed activities. The works are on a large scale, consuming about 800,000 tons of coal a year. Coal iron ore and limestone are available under favourable conditions, and Australia is assured of a prosperous iron and steel industry provided her workmen will work.

Vexatious Customs Regulation

Strong Feeling In British Columbia Against Taxation Of Duty on Goods Produced In Eastern Canada And Shipped To West Via New York and Panama Canal

Strong feeling prevails in British Columbia with regard to the exaction of duty on goods produced in Eastern Canada and shipped to Western Canada via New York and the Panama Canal. The agitation gained momentum, it will be recalled, when the Hon. John Oliver, Premier of the Province, directed attention to the collection of duty amounting to several thousands of dollars on a shipment to the Pacific seaboard of steel rods originating in the Province of Nova Scotia. Reference was made to this matter by the *Canadian Mining Journal* and the demand that British Columbia then made that a Canadian Customs Official be placed at New York in order that Canadian goods might be shipped to the west via that Port in bond was made the subject of favorable comment.

On the 15th November last the Hon. Mr. Oliver made a statement to the Legislative Assembly of British Columbia in support of a resolution standing in his name and demanding the abolition of the anomaly of an interprovincial tariff and to facilitate this that a customs officer be appointed by the Dominion Government for duty at the Port of New York. The resolution went the length of giving the Province authority, in the event of the necessity arising, of making a test case of the point of the legality of the collection of the duty described, it being the opinion of Premier Oliver that the Dominion Government would be unable to sustain its position under the terms of the B. N. A. Act. The Premier, however, softened the harshness of the resolution by the explanation that it was not expected that the Government would be compelled to go to extremes. It is significant that, subsequently, the Hon. Jacques Bureau, Minister of Customs & Excise, caused it to be publicly announced that he is prepared to recommend that a Customs Officer be stationed at New York. It appears, therefore, that the dispute is to be amicably settled.

The statement of the Hon. Mr. Oliver, however, is interesting as it fully recites the circumstances of the case in question and is a striking illustration of the transportation developments that have been taking place since the opening of the Panama Canal a few years ago. He said:

"In supporting the resolution now before the House I wish to do so absolutely free from any tinge of partisan politics," the Premier declared, in a written statement which he read to the House. "To my mind the question is one of Provincial rights under the Constitution pure and simple, and as the customs regulation which is being called in question is one that has been in force apparently for a number of years, and has been effective both under Liberal and Conservative administrations so that both political parties may reasonably be held equally responsible, that fact alone, I think, should be sufficient to remove the matter from any question of partisanship.

"I think a short simple statement showing how this question came before the Government may be in order. This matter was first brought to my attention when in Ottawa in January last by J. B. Thompson, president of the Vancouver Board of Trade. When I was told that the Dominion customs authorities were collecting duty of steel rods manufactured in Nova Scotia I could scarcely credit the information. I was, however, shown a letter signed by R. T. Farrow, Commissioner of Customs at Ottawa, addressed to Mr. Thompson, from which I quote as follows:

"'I return herewith copy of letter from Mr. McDougall to the secretary of the Board of Trade, Vancouver, which you left with me this morning, respecting the collection of customs duty at Vancouver on 550 tons of wire rods shipped from Sidney, Nova Scotia, to New York by the Dominion Iron and Steel Company, and there transshipped by vessel to Vancouver.'

"Again I quote from the same letter:

"'No Canadian Customs officer stationed at New York for the purpose of supervising shipments of this character and certifying to manufacture. This Department has no power under the law to admit goods shipped in this manner free of duty.'

"I quote from the letter of Mr. H. H. McDougall as follows:

"'The Dominion Iron and Steel Company, of Sydney, Nova Scotia, in October last shipped 550 tons of wire rods by steamer to New York, there connecting with one of the Canadian Robert Dollar boats to Vancouver, through routing being arranged before the shipment left Sydney. On arrival here on the 27th of December, the Collector of Canadian Customs demanded and forced payment of $3,512.52 duty and sales tax, and which was paid under protest. Strong appeals were made to the Department at Ottawa, but without avail. Without adding duty and sales tax we could have purchased these rods from Belgium for $11.00 per ton less, or $6,050 on the shipment, and with customs charges makes the difference $9,562.00.'

Ottawa Astonished

"I brought the matter to the attention of both Premier King and the Hon. W. S. Fielding, Minister of Finance, and both gentlemen expressed their astonishment at the facts disclosed. On my return to Victoria I again took the matter up with Premier King, forwarding him copies of both Mr. McDougall's and Mr. Farrow's letters, and particularly directing his attention to Section 121 of the British North America Act. Again on April 26, 1923, I wired Premier King more directing his attention, not only to the matter of steel rods but also to asbestos mined in Quebec and shipped to Vancouver via New York and upon which customs duty was collected upon arrival at Vancouver. I also drew attention to the advice received by salmon canners, that canned salmon destined for Eastern Provinces, shipped through the Panama Canal and transferred at New York

would upon re-entering Canada, be subject to customs duties.

In July last I was advised by the Premier's private secretary that an Order-in-Council had been passed on the 5th instant directing the refunding of the duty on steel rods. It does not appear, however, that collection of customs duties on Canadian made goods has ceased.

"In regard to the duty on asbestos I have a letter from Taylor, Forbes & Co., of Vancouver, dated April 16 last, in which they say:

" 'Asbestos cement, which, as you know, is mined almost entirely in the Province of Quebec, can be purchased from the Canadian Asbestos Company at their mines, shipped to New York by rail, transshipped there and brought around through the Panama Canal to Vancouver. In order to do this it is necessary to pay a duty on the material coming back into Canada of 25 per cent. In spite of this fact it can be laid down in Vancouver by this route for about 40 cents per sack of 100 lbs less than if it is brought direct from the mines to Vancouver by either of the transcontinental railway lines.'

"I have also a letter from the Canadian Asbestos Company of Montreal dated March 15 last, from which I quote as follows:

" 'For your information we might state that we ship our asbestos cement via New York and pay duty on the same entering Canada again, and we can lay it down in Vancouver $6.75 per ton cheaper than if we shipped it all rail through Canada.'

"Further on in this letter they say:

" 'It is only recently that we succeeded in getting the railways in Canada to give us a rate of $1.32½ per 100 lbs. The rate last year from Thetford Mines to Vancouver was 1.57½ per 100 lbs.'

"I next refer you to the Hansard report of March 16, 1923, where Mr. Ladner, M. P., asked if the Government had refused to place a Customs Officer at New York, and the answer thereto given by Hon. Mr. Bureau is as follows:

" 'An application has been made to place a customs officer at New York to look after the traffic that goes via the ocean and the Panama Canal. This matter has been under the consideration of the department, and while the department has not decided definitely, it feels inclined to refuse the application, because this would divert traffic towards the United States and all the Canada railways would get out of it would be the haul from the point of departure to the boundary—the whole of the railroad haul to the sea and the whole of the ocean freight would go to the United States.'

In Interest of Railways

"I think the only construction to put upon this statement of the Minister of Customs would be that the customs regulation which requires duty to be paid on goods transshipped at New york, or any foreign port, was made primarily in the interests of the railway companies. This view is further confirmed by a letter from the Honorable the Minister of Customs to the secretary of the Vancouver Board of Trade, dated May 1, 1922, which reads as follows:

" 'I am in receipt of your letter of the 19th ultimo, referring to a delegation from your board which waited upon me some time ago respecting the assignment of a Canadian customs officer to duties at New York in the supervision of transshipments of Canadian goods forwarded to British Columbia from points in eastern Canada and vice versa. I find it has always been the policy of all governments to decline to entertain applications for this service, and after careful consideration of the matter, I have decided to take the same view of the question, believing that the granting of the application is not in the general interests of the Dominion in view of the great expenditure incurred in constructing transcontinental lines in Canada.'

"I think it is quite easy to see from the last sentence quoted that the dominating influence opposed to the establishment of a customs officer at New York is the interests of the transportation companies.

Start Shipping Line

"When in Ottawa in August last I again took up the matter with the Minister of Customs and was advised by him that arrangement had been made whereby a line of merchant marine would ply between eastern Canadian and western Canadian ports. The steamer Margaret Coughlan was then in process of loading for Vancouver, and the owners of this vessel appeared to be strongly opposed to the appointment of a Canadian customs officer at New York as being inimical to their interests, possibly even to the extent of preventing their venture from being a success. I must admit that the arguments used made some impression upon my mind, and I communicated with the Vancouver Board of Trade on the subject. However, I found the board did not take the same view as the Minister of Customs, and decided in favor of continuing to press for the establishment of a customs officer at New York.

Urges Appointment

"On September 6 last, I again wrote to the Minister of Customs urging the appointment of this officer, and when the Minister was in Victoria recently I further pressed upon him the necessity for appointing this official, and also for the discontinuance of what, to me at least, appears to be an allegal practice of collecting customs duties on Canadian goods. More recently I have received a copy of letter forwarded by Dingwall, Cotts & Co., agents for the owners of the Margaret Coughlan, dated November 6, and addressed to the Minister of Customs in opposition to the appointment of a customs officer at New York. I also personally received a letter from Dingwall, Cotts & Co., dated November 3, from which I quote as follows:

" 'We beg, however, to place before you our opinion, that the appointment mentioned would be of very little, if any, benefit to Canadian interests in comparison with the harm done to other lines of Canadian activity, principally those of railroading and shipping.'

I am glad, however, to state that Messrs. Dingwall, Cotts & Co. have changed their views considerably, and in a letter, dated November 8, directed to the Minister of Customs, they say:

" 'These facts alter our views considerably, and under the circumstances we would not oppose the appointment of a Canadian customs officer at New York.'

Contrary to Act

"I think I have shown fairly conclusively that there is in existance a customs regulation imposing duty on Canadian goods moving from one part of Canada to another part of Canada, if it so happens that such goods in transit are transshipped in foreign territory. I think

I haveI have shown that this customs regulation has been framed in the interests of transportation companies, particularly railway transportation companies. I have shown that in one instance the duty collected has been refunded. I think I have shown that the imposition of this duty is contrary to Section 121 of the British North America Act, and in this I have the opinion of Mr. A. V. Pineo, who says:

"'This section is found under a group heading with other revenue clauses which clearly extend to Federal legislation. I am of the opinion that so far as customs duties are concerned it would operate to restrict Federal legislation as well as Provincial.'

"I construe this opinion of our legislative counsel to mean that the Federal Parliament has no power to override the very clear wording of this section of the British North America Act.

Will Aid Suit

"Notwithstanding all the representations made to the Government at Ottawa on this matter, I am advised that a large department store in Vancouver has a large consignment of Canadian made goods in transit from Toronto via the City of New York and the Panama Canal to Vancouver. These goods will be subject to Canadian cutoms dutis and I wish explicitly to draw the attention of the House to the wording of the Third Resolution in the motion now before us, urging upon the Provincial Government to take such steps as it properly may to resist the imposition of customs duties upon Canadian products and manufacturers destined to British Columbia, or produced or manufactured in British Columbia and destined to any other province of Canada.

"If the House agrees to this Resolution it will mean that the Government will become a party, if necessary, to a suit resisting the demand for the customs duties referred to. I sincerely hope, however, that better counsels will prevail with the Federal Government, and that the whole matter may be amicably adjusted. In fact I may say that I have strong hopes that such will be the result, and I believe that the passing of this motion by a unanimous vote of the House will materially aid in bringing about the desired event."

Ventilation in Cape Breton Collieries

Ascensional System Now Being Organized in Collieries of the Dominion Coal Company

By JOHN MOFFATT

Two years ago it was decided to place all the Dominion collieries under the ascensional system of ventilation. Lying on an angle of inclination to the horizontal varying from eight to twenty degrees, all the Cape Breton coal seams readily lend themselves to this system. For with the main currents led direct to the faces through intake airways as the size of the mine necessitates, it is usually an easy matter to lead the air back into the returns when expanded by the higher temperature of the mine, and made still lighter when diluted with methane. The main return airways are constructed to carry the air to the upcast shafts, permitting a sufficient quantity to escape through the waste workings to keep them clear of gas.

In opening up a new colliery adapted to ascensional ventilation the system would be simplicity itself. But to change to this from some other system in collieries that have been in continuous operation from fifteen to forty years is a big task. It has been so at these collieries and it has called for large expenditure; but these will be more than repaid when the work is completed, which should take place within the next few months at most of the collieries. In a few it is already completed.

Old Systems Inadequate

The airways of the early collieries of this and other mining districts have not always been given proper attention. Here and there a manager might be found who gave ventilation its rightful place in his management of the mine, and, if permitted, the aircourses were well kept. But usually these had only secondary care and were not so large or so clean as necessity required. This was not always due to carelessness; more frequently it arose from the want of a broad policy on the part of the small operator, who failed to calculate the life of the colliery. Usually small concerns have small policies and do not lay their plans on a large scale. This is true everywhere, and Nova Scotia was no exception. Therefore when a survey of the main airways of the Dominion collieries was made, it was fround that about thirty-three miles iof the main aircourses had to be repaired and remade. This was referred to over a year ago in the **Canadian Mining Journal.** Reference was also made to the tremendous amount of labor involved in cleaning, timbering and enlarging these airways, while giving attention to their extension as the mine developed.

Plaster Stoppings Economical

The fan runs had first attention, and, being usually built of concrete, were reinforced and put into first-class condition. Then the down-cast shafts were examined and all water that might form ice in winter and so block up the air passage was drained off. Strong concrete stoppings were built in the main intake airways. In many cases a second intake airway was added, which greatly increased the volume of air passing into the mine and reduced the water gauge. Stoppings in the secondary airways were built of hard wall plaster and were carried close up to the faces. It took some time to discover that the shock of a heavy shot going off affected the plaster stopping, but this was remedied by a new method of construction.

At first it was thought that stoppings built of logrods and hard wall plaster would be much more costly than brattice stopping, but experience has proved that this is not the case. Brattice cloth exposed to strong currents of air in the mine soon dries up and if not renewed becomes practically useless for ventilating purposes, as the air passes through it too readily, and is not conducted as intended. On the other hand plaster stoppings when properly built last indefinitely and

have little leakage. The first costs are about the same, but the cost of upkeep and replacement of the plaster stopping is very low compared to that of brattice. To this has to be added in the case of brattice the labor of constant examination.

Reduced Power Costs

It was further stated by the *Canadian Mining Journal* that the ascensional system of ventilation would not only largely increase the volume of fresh air at the faces, but would lessen the power costs. This has been fully demonstrated at one of the collieries, where the volume of air entering the mine in 1901 was 100,000 cubic feet but is now reduced to about 30,000 cubic feet per minute; yet a larger quantity passess through each split, and each section is fully supplied with fresh air. The power used in this case is only one-third of what it formerly was. In other words, with only a 50 per cent reconstruction of airways there is a two hundred percent improvement. This is a remarkable increase in ventilation efficiency, and is accomplished by a fan which, but for the enlarging of their airways, would have been scrapped in favor of a new one.

Small Fans Now Adequate

There is another factor to be considered in the item of expense—that of the fan. Small, badly obstructed airways offer great resistance to air currents, and when these fail to supply the sufficient quantity of air the old fan is usually discarded and a new and larger one purchased. This costs money as, in addition to the purchase price of the fan, there is the additional cost in power necessary to drive it. Large, well kept airways increase the life of a fan and lower the costs.

The change that has already taken place in the airways of the Dominion collieries has extended the life of the fan to the full life of nearly every one of the collieries, and has reduced the annual increase of the water gauge by half. That is, the increase of water gauge, which each year under the old system was about 2.4 inches, due to airway extension and added friction, has been reduced to 1.2 inches. As a fan at a colliery must be in continuous operation, is seldom slowed down and then only for a short time, and must be supplemented by an auxiliary in case of accident, the saving from this source alone is large.

Mine Gas Well Diluted

Again, the amount of methane in the mine atmosphere has been greatly lessened by much more rapid dilution. What this means to the safety of the mine is readily understood by all who take the percentage of methane in the return airways as an indication of the true condition of a colliery giving off gas. A large percentage of methane in the mine atmosphere is not only dangerous but prevents the rapid development of the colliery, which again tends to increase the quality of gas driven off. Thus a well ventilated mine could if required, be placed on double or treble shift, while it would be impossible in a heavily methane laden atmosphere to operate more than one shift in the twenty-four hours.

An investigation now taking place into the cause of an explosion in Britain has as its chief feature the quantity of methane reported by the inspectors of that mine. The lowest amount was said to be about 4 per cent. Two and one-half per cent. of methane in mine air is close to the danger point, and it is the aim in the Dominion collieries to keep below this point.

Warning Against a False Sense of Security

When the new system is put into full operation in the Cape Breton collieries, it may be found difficult to persuade some of the mine managers to reduce the speed of the fans, fearing a reduced quantity in the volume of air reaching the faces. But it will be fully demonstrated that all fears are groundless and that although the amount of air entering the mine may not be quite as large as formerly, yet by more equal distribution, better conducted air currents, and a greatly reduced loss by leakage, the volume reaching the faces will be largely increased. However, in order that the system should give the expected results, the present practice of keeping all crosscuts, except the one nearest the face, closed should be maintained. Should a reliance on the larger quantity of air circulating in the different air splits stimulate the feeling of security and lead to neglect of the proper conducting of the air up to the faces, then an element of danger and not of safety may be introduced. This will not be so in the Nova Scotia collieries, where mine officials are usually well trained and attain to their positions by ability and a proved capacity to handle their collieries.

To sum up, the net gain of the ascensional system of ventilation is (1) greater safety of the mine through more rapid dilution of the mine gases; (2) improved working conditions for mine workers through separate fresh splits for each district; (3) lower temperatures in the inner workings; (4) increased volumes of air with reduced power costs; (5) lower depreciation charges due to prolonging the life of the fans, with a lessened expenditure for new machines.

LOW-FREEZING EXPLOSIVES

In the old days, when nitroglycerin dynamites were in general use, many quarry and mine operators at this time of year were making necessary repairs on the dynamite thawing house, in preparation for the coming winter. The thawing of explosives was usually a troublesome operation and, when improperly conducted, a dangerous one.

The development of gelatin and ammonium nitrate dynamites in which nitroglycerin is replaced by, or combined with, other explosives and low-freezing ingredients, has practically eliminated the necessity for thawing; it is only in exceptionally cold climates that any difficulty remains.

Explosives chemists have never been able to say definitely at what temperature a certain explosive will freeze, because freezing depends upon the length of time that the explosive is exposed to cold as well as upon the temperature; in other words, a low-freezing explosive is one that is slow freezing. After years of experience and experiment, there have been developed ammonia and gelatin dynamites that are so slow-freezing that they can be considered practically non-freezing. The other desirable features which distinguish ammonia and gelatin explosives are retained in the low-freezing grades. This transformation has been so effective that manufacturers are eliminating the old high-freezing grades; one company will now supply them only on special order. Some brands of low-freezing ammonia and gelatin and permissible dynamites are so slow-freezing that they are being used in most sections of the country on open work all through the winter, without thawing.

Enquiry at Springhill Collieries, N. S.

The Questions of Bumps and Bottom Coal And the Occurrence of Accidents

Because of the number of bumps and the recurring loss of life from this cause in the Springhill collieries, Deputy Minister of Mines, T. J. Brown, was instructed by the Minister to make an enquiry at Springhill with the view of determining the cause and making recommendations to avoid bumps and lessen the number of accidents. This was a big order, to use a street term, but it was carried out in a manner most satisfactory to the workmen, the Coal Company and the other members of the Mines Department. A very searching investigation was made, evidence being taken in the mine and at meetings of the workmen called for the purpose. Other meetings were held in Halifax to weigh the evidence and devise means to prevent or lessen the number and force of the bumps.

On the committee were Daniel Matheson, D. Ross and T. A. Bonnyman representing the employees, all three men having had long experience in mining coal in Springhill Mines. Messrs. W. Herd, Chief Mining Engineer of the British Empire Steel Corporation. T. L. McColl, Mining Engineer of the Acadia Coal Co. an Malcolm Blue, Superintendent of Mines, B. E. S. Co. mainland collieries; Messrs. E. B. Paul Deputy Inspector of Mines Cumberland Co., R. H. Gray Inspector of Mines for Pictou Co. and Thomas J. Brown Deputy Minister of Mines for the Province.

Much interest was taken in the work of the Committee as there was much anxiety and alarm in the minds of workmen because bumps continued to occur and take away life in an instant.

The discussions were marked by an earnestness and freedom of expression such as the case required and each member labored to arrive at a solution unbiased by any personal prejudice.

It was agreed that the evident cause of such serious and sudden disturbances lay in the nature of the roof and pavement. The roof overlying the coal is very strong. Thirty feet of this gives way first and above it is a very strong sandstone. Left without support this great span with its enormous weight exerts pressure at certain points on the pillars which cannot bear it up and suddenly gives way, throwing down great masses of coal with tremendous force and suddenness burying everyone and everything in its way. Even when the pillars are solid and thick enough to resist its pressure the pavement has been found to give way and open and rise as if pushed upwards with some stupendous force, hurling tracks in all directions and displacing timber like so many matches.

When these sudden settlements of the arched roof take place in the pillar workings, or in the waste, the resistance is low hence there are very few accidents, but the earth tremors caused by the settlement is more widely felt on the surface than a more dangerous bump in the vicinity of the working places. As the collieries become deeper the danger increases owing to the greater weight of the superincumbent strata.

The method of mining was first discussed more especially the mining practice at the face. The width of the working place, the thickness of the pillar and the system of timbering were reviewed. The distance between the balances and the length of the boards came under fire and changes were recommended which place the width of the board at ten feet and the distance between balances one hundred and fifty feet. The pillars are to be left thin so that they can be rapidly extracted thereby quickly relieving the pressure. It is generally thought that work should be concentrated in small areas, bords should be rapidly advanced and pillars drawn at once. At such depths as 22,500 feet there should be no old workings resting on pillars, as such practices lead to loss of coal and to bumps, also squeezes.

The fine diplomacy of the Deputy Minister of Mines is seen in that part of his report dealing with balance measurements when he says —"It was generally admitted by all that the older these working balances are, the more dangerous they become in the event of a bump. The longer it takes to drive in the rooms the less pillars there are to take out. If a room is a long time in driving and is going ahead slowly, both nature and human nature are busy nibbling away, with a resultant wide room and narrow pillar and when sudden pressure comes there exists a dangerous situation. Most men would have said that the filling away of the coal falling off the sides by the miners was a dangerous practice, but Deputy Minister of Mines T. J. Brown, knows the temptation of a loose pile of coal lying on the road side and admits that it is only human nature "to nibble" at it now and again, although that very nibbling may invite disaster. He knows also that gentleness makes great and he knows the miner as few other men do and therefore he gently leads.

The most difficult of all the problems was that of the practice of leaving some coal on the bottom at the low side. This custom is as old as the Springhill collieries.

Bottom Coal

The practice of leaving some coal on the bottom at the low side of the room proved to be a more serious matter and more difficult of solution. The Company's representatives contended that this was an unsafe practice as the low side timber was placed on this coal and as a result was not firmly set and in the event of being submitted to pressure would penetrate the coal and be of no use. And further that the coal weathered or softened and the low side timber became loose and useless. They contended that the feet of the timber should be in the solid stone not touching coal in the bottom or low side in order to be effective. They also contended that if the pillar moved or the bottom nugged or kicked as the result of pressure that if the timber is on bottom coal it is more likely to [illegible] men at the working face.

On the other hand it was contended by the miners that leaving in the bench coal on the low side was the safest [illegible] firm enough to withstand this pressure as witness the props being cut into the booms which would indicate their feet were firmly set. They also contended that the base of the prop was less liable to be kicked out if it rested on the "footwall" of coal and it was strongly argued by the men that where the pillar moved towards the centre of

the room, as they often do, that the bottom coal also moved and the timber is not tripped out.

It was also contended by the workmen and others that this footwall was a protection to the miners as the pavement was not so liable to 'open up' if the coal was left there.

However the strongest contention put up by the miners on this question was that when the bottom was left on the low side and at least the low side rail of their road resting upon it that there was a feeling of greater safety to the men loading coal and mining on the low side in the event of an outburst of coal either from the face, high or low side, as the miner was not down in a hole and had a greater chance to escape.

Some miners in the mine seat their lower side props in the bottom, this from choice. Others, and they are in the majority, seat the timber on the coal and men with 30 to 40 years experience in mining feel so strongly that the footwall is safer they would leave the mine were they forced to dig up the low side bottom. In the event of bumps the low side timber has been thrown out with about equal regularity whether seated on the stone pavement or on the coal.

Commenting on this discussion Deputy Minister, T. J. Brown states that the Company's contention in general mining practice is sound. He was inclined to favor the view that conditions exist in Springhill that make exceptions. The Company officials in Springhill are not all of the same opinion in this matter. The officials on our Committee were unanimous in favor of going down to the stone. The workmen's representatives were strongly and unanimously opposed. Mr. Paul favored the workmen's view, Messrs. Gray and Brown were not sufficiently acquainted and had not the local experience necessary to form an opinion of value. The many experienced workmen who so unanimously and emphatically were opposed to taking out the bottom coal on the grounds of personal danger to themselves, and my belief that no selfish motive prompts them to this attitude, forces me to the conclusion to leave this question where we found it, viz., a question of arrangement between local management and workmen, to be decided by conditions as they find them in the working places.

The Minister of Mines and his very able Deputy Minister are to be commended for the prompt action taken and the wisdom shown in inviting all parties directly interested to a joint discussion of this very serious problem and the recommendations made and put into practice will be watched with eager interest by the whole Province.

SILVER AND ITS ALLOYS

Research Will Probably Reveal New Uses in Commerce and Industry

Systematic study of silver and its alloys should result in its wider use in at least two fields, with strong probability of similar results in other directions, according to a report submitted by the U. S. Bureau of Mines to Secretary Work of the Interior Department in response to his recent request for a preliminary study of possible new uses for silver in commerce and industry. The possibility of developing a non-tarnishing silver for use in tableware and the arts and of finding silver alloys suitable for trimming automobiles were set forth as the two fields in which a systematic investigation should result in a wider use of silver.

"Silver has been allowed to fit into places where i would satisfy the requirements, and little systemati research to develop new uses has been done," the Burea of Mines' report stated. "Such research, therefore, ha a better chance of success than if the field already ha been extensively investigated. Although individual pr ducers and fabricators have not overlooked the possil ities of such studies, it is believed that the situation n has reached a stage where, under governmenta: dire tion, these individual investigations could be co-ord nated into a systematic plan of research to increase th commercial and industrial use of silver.

"One of the major possibilities would be through t development of new alloys. It is well known that small percentage, in many cases only a fraction of per cent, of one metal alloyed with another changes t properties of the latter greatly. Everyone is familia with the decided change in appearance caused in copp by the addition of a small percentage of nickel, as w as with the decided change in properties of steel caus by the addition of very small percentages of non-f rous metals. It is entirely possible that a systema investigation would develop alloys or silver which woul have most desirable properties for use industrially commercially.

"One of the chief drawbacks to the use of silver household articles is that it readily tarnishes. If th could be overcome or materially decreased by means the development of an alloy which would not be exc sively expensive, it should result in a great increas in the use of silver articles and, in turn, in a large i crease in amount of silver consumed.

"It is known that certain metals, including cadmiun when alloyed with silver reduce its susceptibility t tarnish. This is mentioned merely as an example. I is entirely possible that other metals or combinatio of other metals with silver would form an alloy le susceptible to tarnish, if not non-tarnishable, unde ordinary conditions.

"There is further the possibility of developing r latively cheap alloys in which only a small proporti of silver will be used which, due to the large consump tion of such alloys, would result in a large increase the amount of silver consumed. Silver-aluminum all deserve consideration in this connection. One of th uses to which such an alloy might be put would be tha of trimming on automobiles. A silver alloy relativ non-tarnishable and solid throughout would have d cided advantages over the present nickel-plated trin The investigation of the possibility of producing suc an alloy is worthy of consideration."

Secretary Work has submitted a copy of this r to Senator Tasker L. Oddie, chairman of the S Commission of Gold and Silver Inquiry, requesting opinion from the commission as to whether the publ interest would warrant the Interior Department u taking the co-ordination of individual investiga and the beginning of a systematic study of new u for silver.

IRON AND STEEL PRODUCED IN SOUTH AFRICA

During the year 1922 three iron and steel plants were in operation in South Africa, giving employ to 1,080 persons. Two plants were not producing The Department of Mines and Industries reports that 1 tons of iron and steel were produced during the y of which 2,090 tons were from electric furnaces. Th total output for the year 1921 amounted to 22,475 tons —U. S. Commerce Reports.

Discovery of Bauxite in B. C.

Deposits Located Near Stony and Demaniel Creeks Reported on By Government Mining Engineer

By ROBERT DUNN

The discovery of Bauxite in British Columbia has been reported on several occasions. Investigation, however, has shown that the material thus far found is not sufficiently high grade for purposes of aluminum manufacture. Recently deposits were located near Stony and Demaniel Creeks, Sooke District of Vancouver Island, of such extent as to warrant their inspection by Wm. M. Brewer, the government mining engineer. His report is to the effect that they contain a low grade of bauxite, the analyses of a representative assortment of samples indicating that the ore is so low, comparatively, in alumina and high in silica or insolubles as to obviate the possibility of it being useful for the production of aluminum. Owners of the claims, however, have found a market for the material for the refining of gas and are anticipating that with development and experimentation further commercial utilities will be discovered.

Mr. Brewer writes of these Vancouver Island deposits as follows:

"In Memoir No. 96 describing the Sooke and Duncan Map Areas, Vancouver Island, by G. H. Clapp, published by the Canada Department of Mines, Geological Survey Branch, reference is made to ochreous clay or impure bog iron ore in the bed of Demaniel Creek, one half mile south of Young Lake in the Sooke District. This deposit is referred to by Clapp as being adapted for a good base for colored paints but valueless as iron ore on account of the low iron content which Clapp places at 15.5 per cent.

"In the Minister of Mines Report for 1922 this deposit is also described by W. M. Brewer, Resident Mining Engineer of the Western Mineral Survey District (No. 6) and included in the description of the Demaniel Creek deposit reference is made to a deposit of similar material occurring on Stony Creek, a tributary of Demaniel Creek, which may be an extension of the Demaniel Creek deposit.

"The examinations made by both Clapp and Brewer were apparently confined to a consideration of the possibilities of iron making or the manufacturing of paint from the deposit of limonite or bog iron ore, but samples taken from the Demaniel Creek deposit by Victor Dolmage of the Geological Survey of Canada during the fall of 1922 when assayed in the Mines Branch of Ottawa created considerable interest, because the detailed analysis of the ore showed that the mineral approached bauxite more closely than had been previously found in B. C. Owing to this information the deposits on Demaniel and Stony Creeks were re-examined by Brewer and the samples were analysed as samples of bauxite rather than as samples of iron ore.

The results of the analyses of two samples from Stony Creek and two samples from Demaniel Creek are as follows:

Analysis made on the solubility in sulphuric acid

	Loss on Ignition	Insol.	Al_2O_3	Fe_2O_3	CaO	MgO	Ti.
Stony Creek, Sooke..	12.3%	25.0%	29.5[illegible]	30.5	0.4	nil	nil
Stony Creek, Sooke..	13.4	30.7	30.0	23.0	0.4	nil	trace
Demaniel Creek, Sooke.. ..	10.2	62.2	19.0	6.0	2.5	nil	nil
Demaniel Creek, Sooke.. ..	16.0	35.0	29.0	16.0	1.3	nil	trace

Of course the above mentioned analyses show that the samples of the mineral are not sufficiently pure to be used in the manufacture of aluminum. This is very clear when the above analyses are compared with the analyses of bauxite from which aluminum is manufactured in the United States as follows:

Analyses of Bauxite:

Location	SiO_2	Al_2O_3	Fe_2O_3	TiO	Water at 100°	Authority
Alabama	.7	56.60	2.75	2.3	25.30	McAlley; Ala. Sci. Soc.
Arkansas	10.64	57.48	2.56	[illegible]	28.36	Mead: Econ. Geol. Vol. 10. p. 48
Georgia	14.47	54.57	1.93	1.63	[illegible]	Sherer: [illegible] Bull. 31, p. 79.
	8.84	58.38	1.30	1.80	29.25	[illegible] Bull. 31, p. 70.
	10.63	57.91	[illegible]	1.11	28.70	[illegible] Bull. 31, p. 37.
Tennessee	18.38	49.90	4.13		[illegible]	Phalen: U.S. Geol. Sur. Min. Res. 1912, p. 5.
	17.16	53.34	2.10	[illegible]	[illegible]	[illegible]
French Bauxite	2.8	[illegible]	[illegible]	3.1	10.80	Phalen: U.S. Geol. Sur. Min. Res. 1910, p. 8.

Owing to the low grade of the bauxite ore in the deposits that occur on Demaniel and Stony Creeks it became necessary to find some other use than the manufacture of aluminum in order to give the mineral a commercial value.

Almost by accident as it may be termed, such other use was found from the fact that limonite or bog iron was found to be adapted for refining gas, the oxide of iron being used to absorb the sulphur in the gas manufactured on the Pacific Coast. An order for a shipment of the limonite or bog iron ore for use in the Victoria Gas Works was received by Dan Campbell, the owner of the bauxite deposits. In making this shipment he found that the lighter colored clay material became so much intermixed with the iron ore that it was very difficult to separate the two materials before shipment. The Gas Works however reported to him that the lighter colored clay material or bauxite appeared to be as well adapted for refining the gas as the limonite or bog iron ore and as the price paid for the mineral was considerably greater than the market quotations for bauxite ore in the east, it is very satisfactory to have secured a market for the production of the deposits.

In this connection it is gratifying to learn by perusal of an article in one of the leading journals, Journal of Society Chemistry and Industry, that at the new oil refinery erected by the Anglo-Persian Oil Company in Llandarcy, South Wales, bauxite is used in the refining of oil as explained in the following paragraph:

"The kerosene fraction receives its final treatment by means of filtration through granulated bauxite a reddish brown aluminum ore. The bauxite previously roasted, removes the sulphur and color, the oil coming from this process sweet in odour and perfectly colourless, being in fact, the highest grade of lamp oil or kerosene. After a certain period of use the bauxite is re-roasted to burn out the impurities taken from the oil, after which it can be used again."

From the same article it is ascertained that in the extraction of paraffine wax from crude oil, bauxite is also used, the wax undergoing a final treatment of filtration through bauxite to remove the color.

Although the samples taken from the surface outcroppings of the deposits on Demaniel and Stony Creeks up to the present time, show by analysis that the ore is so comparatively low in alumina and high in silica or insolubles, yet it may be encouraging to the owners of the property to also know that samples taken from the Alabama and Georgia deposits when first discovered about 1893 were found to sometimes vary in their contents to such a considerable extent that practically every wagon load mined had to be analysed because at that time no bauxite was considered sufficiently pure to manufacture aluminum unless the ore carried over 52 per cent. Al_2O_3 and not more than 2 or 2 per cent SiO_2.

In addition to being used for the manufacture of aluminum bauxite is used for the manufacture of artificial aluminum abrasives, such as alundum, it is also the chief crude material for the manufacture of various aluminum salts, such as alum, aluminum chloride and aluminum sulphate and is used to some extent in the manufacture of aluminum refractories which are sold as bauxite-brick or high alumina-brick.

It is a question whether the low grade bauxite on Demaniel and Stony Creeks can be utilized in the manufacture of any of the above mentioned articles except bauxite-brick in the manufacture of which the material is used without preliminary treatment other than drying and fine grinding for mixing with other ceramics material for refractory purposes, but the problem as to the uses that the mineral in the deposits on Demaniel and Stony Creeks is one that must be settled by the chemist rather than by the Mining Engineer.

So far as regards the quantity of the mineral in the deposits mentioned it is impossible at the present time to make any other than the wildest kind of a guess, for while it is quite possible that the two deposits are connected and extend for nearly a mile in length with a proven width at one point of upwards 40 feet and an undetermined depth below the beds of both Demaniel and Stony Creeks, the actual prospecting work so far done has not shown that such conditions actually exist, but on the other hand indications point towards the possibility of the occurrence of the mineral attaining such dimensions as above referred to.

PURIFICATION OF COPPER SULPHATE SOLUTIONS

Experimental work on the purification of copper sulphate solutions from the leaching of low-grade oxidized ores is being continued at the Pacific Experiment Station of the United States Bureau of Mines at Berkeley, Calif. Attention has recently been chiefly given to the removal of ferrous and ferric iron from such solutions, together with any aluminum present. The use of powdered limestone, or copper oxide, or natural oxidized minerals of copper, will by hydrolysis precipitate, first, ferric iron, later aluminum, and then copper as basic sulphates. The copper, however, is hydrolysed before ferrous iron, so that it is necessary to oxidize the ferrous iron to the ferric condition before hydrolysis. Work on use of air for agitating the pulp during hydrolysis and for oxidation of the ferrous iron showed that at the acidities of solution where ferric iron and aluminum were precipitated, the ferrous iron was slowly oxidized and the resulting sulphate immediately hydrolysed. By further lowering the acidity by adding more limestone, copper oxide or other hydrolysing agent, the speed of oxidation of the ferrous iron in solution was increased five to ten fold, but some copper was precipitated with the ferric and aluminum basic sulphate. However, on further agitation, this colloidal material approaches nearer to the composition of ferric and aluminum hydrates, and sulphuric acid is formed. The sulphuric acid formed redissolves the copper from the precipitate. Direct addition of sulphuric acid removes the copper immediately, if it is not desired to agitate the solution too long. The changes in these solutions were followed by the air electrode-calomel electrode, developed some time ago, which has been greatly simplified so that it can be used in dirty solutions and still indicate the points at which all the iron or aluminum or ferrous are precipitated from the pulp without the need of any chemical analysis. Numerous bimetallic electrodes were tested for their value in hydrolytic purification by the Bureau of Mines process. Some work remains to be done, but the process is believed to be adaptable to commercial use.

Oil Prospects In Southern Alberta[1]

By M. Y. WILLIAMS

Following the development of the Kevin-Sunburst oil field of Montana in 1922, active drilling operations were commenced just across the International boundary line in Alberta, about 19 miles from the proven territory. The border town of Coutts, Alberta, is near the scene of operations. Drilling commenced in the autumn of 1922, and by the spring of 1923 about one dozen wells were located, all but 3 being on the Quarantine Reserve, tp. 1, range 15, west of the 4th Meridian. By the commencement of summer, four wells were down from 1,700 to 2,850 feet, two of which reported favourable showings of oil. Four other wells were ready for drilling, and operations were planned by other companies.

Meanwhile the Kevin-Sunburst field developed until by the end of summer it contained 100 producing wells and comprised a territory about 11 miles east and west by 3 miles north and south. During the summer, however, crude oil dropped steadily to a low price of 50 cents a barrel. As a result, drilling operations slowed down, and the development anticipated on the Canadian side did not materialize. The Canadian companies engaged in actual drilling experienced many physical difficulties, and by autumn little had been added to the accomplishments of the early summer.

Geology. The oil of the Kevin-Sunburst field is obtained in the Kootenay (perhaps including the Dakota) sandstone and the underlying Ellis sandstone and shale of Jurassic age although oil is also found in the still lower Madison limestone. The wells average little more than 1,600 feet in depth, and start in the Colorado shale. As shown by D. B. Dowling in the Summary Report of the Geological Survey for 1922, Part B, the formations dip northward, the Kootenay in the vicinity of Coutts lying from 1,890 to 1,930 feet below the surface. The dip to the north between the Kevin-Sunburst field and the International boundary is about 1,150 feet. This drop in elevation makes the Canadian field less favourable for oil accumulation, but may not preclude the occurrence of commercial pools, in structures subsidiary to the main dome, or possibly separated from it by tight areas in the producing sands. The test wells in Alberta were located so as to explore promising terraces, and northward extensions of the Kevin-Sunburst structure. The locations were inspected by the writer and appeared to be marked terraces worthy of exploration

Nowhere in southern Alberta except in the vicinity of the Sweet Grass hills, referred to above, and in the foothills of the Rocky mountains, do the oil horizons rise as near the surface as they do in the Kevin-Sunburst dome. The Sweet Grass hills are intrusive plugs which have penetrated and domed up the Mesozoic formations, and their effect upon oil accumulation can only be told by drilling. When the writer left the field, late in September, two wells in Montana were approaching the oil horizons, one on the east and one on the west of East Butte. Both wells had struck flows of gas.

The structure of the foothills of the Rockies is complicated by intense folding and faulting, and has not as yet been closely studied by the writer.

Summary of Exploration

The results of drilling in the vicinity of Coutts may be summarized as follows, taking the wells in general order from west to east:—

Well drilled by Northwest Co., in Red Coulee, L. S. 6. Section 5, tp. 1, range 16, west of 4th meridian; Kootenay sandstone at 1,890 feet, oil reported at 2,505 in grey sandy shale, bottom of well in chert formation at about 2,670 feet.

Well drilled by Coutts Sweet Grass Oils, Ltd., on S. E. ¼, Sec. 1, tp. 1, range 15, West of 4th meridian. Kootenay sandstone at 1,900 feet, Ellis shale reported at 2,300 feet. Oil showings reported at 2,340 feet, 2,380 feet, 2,424 feet, 2,440 feet, 2,450 feet; and gas at 2,615 feet, and 2,850 feet; bottom of well at 2,852 feet. This well was lost because of a crooked hole and consequent loss of casing, etc.

Well drilled by Lethbridge Oils, Ltd., on S. E. ¼ Sec. 12, tp. 1, range 15, West 4th meridian. Kootenay sandstone at 1,950 feet, bottom of hole at 1,985 feet.

The logs of the foregoing wells were furnished by the companies concerned.

Well drilled by the Border Oil Co., with a diamond drill, on S. E. ¼ sec. 6, tp. 1, range 14, West of 4th meridian. Record made by the writer from examination of the drill cores: Surface deposits to 25 feet; Milk River sandstone to 203 feet; Colorado shale including sandstone beds and streaks to 1,860 feet; beds partly sand, partly shale, and thought to represent the Kootenay to 1,920 feet. Considerable oil made its way to the surface escaping against the feed water pressure, at a depth of 1,875 feet, and again at 1,920 feet. The well had reached 2,000 feet when last visited about the middle of September, the lowest 80 feet being shale.

A summary of the log of the diamond drill boring of the Troy-Sweet Grass Well No. 1, on N. E. ¼ S. W. ¼ Sec. 21, tp. 34, N., range 1 West. Toole Co. Montana is as follows: Elevation 3,543 feet; Colorado shale to 760 feet; Kootenay sandstone to 1,272 feet. Ellis (Jurassic) shale and limestone to 1,370 feet. Considerable oil in vugs and cracks in lime shale 1,365—1,370 feet. Sulphur water at 1,370 feet. Madison (lower Carboniferous) limestone to 2,153 feet. Oil showing through lower half of Madison in vertical fractures. Devonian shale and limestone to 2,486 feet. Oil showings at 2,209 feet, 2,338 feet, 2,475 feet. Probably Silurian (anhydrite) to 2,600. (Taken from graphic log by J. B. Gerlough).

Outlook. Several other deep wells have been drilled in the vicinity of the Sweet Grass and Kevin-Sunburst structures and other wells are exploring the areas between the oil fields and the gas fields to the northeast which are now proven as far as Etzikon Coulee, southeast of Foremost. The presence of large quantities of gas at the latter locality, in various horizons in the

[1] Published by permission of the Director of the Geological Survey, Ottawa.

Colorado shale, and of heavy oil in the Kootenay sandstone, is cause for hope that where suitable structure exists between the Alberta gas fields and the Montana oil fields, commercial pools of oil may be found.

The employment of competent geologists by companies exploring this region, is to be highly commended, as it is only on suitable structure that oil or gas accumulations are to be expected.

AN ELECTRON GUN*

Making Practical Use of the Ultimate Particles of Matter

Have you ever seen electrons pattering against a glass screen, like bullets from a machine gun on a distant target? Of course, one cannot see either the electrons or the bullets, but only their effect on the target. An electron is the smallest thing yet conceived as having existence as a separate body. Physicists estimate the diameter of an electron as a very small fraction of the wave length of light, itself about one fifty-thousandth of an inch. These tiny corpuscles of negative electricity and the relatively much larger positive ions are believed to be ultimate constituents of matter.

By processes now in daily use electrons can be separated from the atoms of some substances. Cathode rays, or streams of electrons, can thus be produced. Electrons have velocities which may be almost as great as 186,000 miles per second, the velocity of light. Notwithstanding inconceivable minuteness and great speed, electrons are in a measure controllable and are used in many ways every day. Apparatus for dealing practically with things so intangible to our unaided senses partakes of the fascination of magic.

Many devices have been made to employ the properties of electrons both in physical research and in the industries. One might mention the three-element vacuum tube whose use in radio has made it a household article. Another device is the low-voltage cathode ray oscillograph, devised about two years ago by Dr. J. B. Johnson in the Bell System Laboratories of the Western Electric Company.

For this particular oscillograph conceive a pear-shaped clear glass bulb with a long cylindrical neck and a carfully rounded big end nearly flat. The inside of the big end is made a fluorescent screen by coating it with a paste of suitable materials. Wherever and while electrons impinge on this screen, a brillant spot or line of greenish light appears.

At the base of the neck is the "electron gun"—not an old-fashioned blunderbuss, but a modern machine gun concentrating its fire within a small circle. With an electric current flowing, the electrons are shot off from a small cathode made of oxide-coated platinum ribbon in the form of a loop with its closed end bent into a ring at a right angle to the electron stream. To reduce damage to the filament from the blows of relatively heavy positive ions, this form permits them to pass the main portion of the cathode with relatively few "direct hits."

Immediately above the cathode is a metal shield with a tiny hole through its center. Directly above this hole is a thin platinum tube one millimeter in diameter and one centimeter long, which is the electrical anode and also the barrel of the "gun." It points towards the center of the target, or screen. The whole "gun," its electrical connections and its appurtenances are sealed into the tube airtight. An almost perfect vacuum is created inside the tube and then a very small quantity of argon gas is admitted. This gas helps greatly in concentrating the fire of electrons on a definite spot.

In the directing of its fire the electron gun differs from the ball and powder variety. The electron gun is not swung about, but its stream of projectiles is deflected by means of electric or magnetic forces. The deflectors consist each of two pairs of small parallel metal plates. One pair is at right angles to the other, while both pairs are parallel to the axis of the gun, which is the direction of the undeflected electron stream. The deflector is a short distance above the anode (the barrel of the gun). Therefore the stream of electrons passes between the plates of each pair.

The usefulness of this tube oscillograph comes from the fact that the stream of electrons forms a nearly weightless pointer whose movement will accurately follow the changing conditions in the circuit to which it is connected. No frequency that can be produced in in an electrical circuit is too high for this pointer to follow. Thus we can study the shapes of electrical waves from the lowest frequencies of power generators up through the speech range to the highest radio frequencies. This is very useful in generator design, in telephone engineering, in testing magnetic properties of materials, in radio, and in classroom demonstrations of all sorts of electrical phenomena.

* Research Narrative No. 67, Engineering Foundation, New York.

PREPARATION OF FERRIC SALTS

Investigative work on the preparation of ferric salts has been concluded at the Pacific Experiment Station of the United States Bureau of Mines, Berkeley, Calif. The object of this investigation was to prepare solutions of ferric salts suitable for the hydrometallurgy of complex ores, and by methods that would have promise of commercial success due to their simplicity and cheapness. Observations made at the Tucson station of the Bureau of Mines that ferrous sulphate solutions could be oxidized to ferric solutions by air containing a small amount of sulphur dioxide, with simultaneous formation of sulphuric acid, were taken as the basis of a long research on oxidation by air. In stronger solutions the first thing that happens is oxidation of ferrous to ferric sulphate from hydrolysing. Later, sulphuric acid begins to form and continues up to a 4 or 5 per cent solution. Acidity of the solutions tends to prevent these reactions taking place with any speed, particularly if all the iron is present at the beginning as ferrous sulphate. The optimum temperature for this reaction is at about 35 to 40° C., which is easily attained by using warm or hot burner, or roaster gases. The application of this process to the treatment of ores is being followed up by the Bureau of Mines at the Tucson station.

MANGANESE SHIPPED FROM BRAZIL

During August, 8,407 metric tons of manganese ore were shipped from Rio de Janeiro and 4,200 tons from Bahia. Of this tonnage the United States took 11,720 tons.—U. S. Commerce Reports.

THE MINING DISTRICTS

By THE JOURNAL'S CORRESPONDENTS

NORTHERN ONTARIO

Cobalt—During the month of October the Nipissing ined ore of an estimated net value of $175,800, and ipped bullion of an estimated net value of $64,537. While the output in ounces is approximately the same. hipments were smaller than usual. The low-grade ill treated 7,254 tons and the high-grade plant 177 ns, the refinery shipping 101,000 fine ounces of ullion. There were no unusual developments under-round, stoping operations continuing about the same. he company is proceeding with the development of he Powell and Waite claims in the Rouyn District, on hich it has taken an option.

The Colonial continues to meet with good results n its development of the lower diabase-Keewatin ontact at a depth of approximately 900 feet. The irst shipment of high-grade ore, consisting of 10 tons. as just been made, and stoping is resulting in a teady production. The shipments of mill rock to the Mining Corporations mill in Cobalt are being continued, nd it is understood that milling operations will hortly commence. The dispute as to the ownership of the big silver nugget recently found in the Gillies Limit appears to be the result of confusion as to the manner in which claim boundaries should be run. It is understood that some surveyors are of the opinion that with claims staked in that part of the limit thrown open in July 1920, the prospectors' lines govern, as in unsurveyed areas, while other surveyors believe that the claims must represent aliquot parts of a block. This naturally gives rise to a good deal of confusion, as it depends upon the particular surveyor doing the work which lines are to govern. It will, no doubt, be necessary to have a ruling from the Department of Mines on this point before the matter is cleared up.

Kirkland—The freight congestion in the Kirkland district is giving operators there a good deal of anxie ty and annoyance. The railway facilities will only permit the spotting of seven cars a day, while at present there are approximately 50 cars of freight waiting to be unloaded. This results in very serious delays and cars are sometimes held up for weeks. As soon as the branch railway is in operation into Kirkland this situation will, no doubt, be relieved; but in the meantime many delays are experienced. This is particularly the case with the Lake Shore, which expected to put its 300-ton mill into operation this fall. Due partly to delay on account of freight congestion and failure to deliver materials on time, it is probable that the enlarged mill will not be run ning until next spring. In view of this the manage ment has decided to proceed immediately with the continuation of the shaft to the 1,000-foot level. The main vein has recently been cut at 800 feet, where it shows values that compare very favorably with those on the upper levels. At 600 feet stopes have been opened for a length of almost 1900 feet, and there seems to be little question but that the Lake Shore has the richest ore of any gold mine in Canada. One stope, having a length of 350 feet, is stated to average over $50.00 a ton, while several other stopes also give high values.

In drifting toward the Lake Shore boundary, which is still several hundred feet away, the Wright-Hargreaves is also understood to be getting the richest ore in its history, and it is expected to result in higher mill heads. While the average grade treated by the Wright-Hargreaves is considerably lower than at some of the other properties, this company has been the highest dividend payer in the Kirkland district, but will, no doubt, be exceeded by the Lake Shore when the enlarged mill is in operation.

Better results are being encountered by the Kirkland Gold, some new ore having been found on the 400-foot level.

At the Tough-Oakes, developments continue to give good results, and it should not be long before that company's mill is once more put in commission.

The most important discovery in the Kirkland district in recent months has been made on the Lebel Oro, where some rich ore was encountered in the shaft.

Developments as a whole throughout the Kirkland district are exceedingly promising, and production next year should be double that of the present year.

A statement is being prepared by the officials of the Argonaut in connection with that property, which shows an encouraging state of affair and holds out a good deal of encouragement for the future. A considerable tonnage of good grade has been developer, and it is expected that early in the new year the tonnage will be raised to 200 tons a day. During the first few days of November the ore averaged $17.00 a ton, and costs have gradually been brought down until in October they were $6.30 a ton. One of the most important features in connection with the development of the property is the fact that the copper content of the ore decreases as depth is attained. The derable trouble, and when cyaniding was first started presence of copper in the ore has given rise to consi- the copper content was so high that it resulted in a very heavy consumption of cyanide and a poor extraction. For a time the cyanide end of the mill was cut out, and the gold was recovered by amalgamation and flotation, the flotation giving a copper concentrate carrying gold, which was shipped. Still later, amalgamation, flotation and cyaniding were tried, but it is now found that the copper content has diminished to such an extent that the flotation end of the mill can be cut out and a satisfactory recovery made by amalgamation and cyaniding.

During the first few months the mill was in operation the monthly recovery was comparatively low on account of the fact that a considerable portion of the tonnage was drawn from the old sand fore dumps. These have now been used up and all the ore is being taken from underground, with a consequent improvement in grade.

At the recent annual meeting of the Tech Hughes, held in Buffalo, one of the most important announce-

ments was to the effect that on the 10th level a length of 400 feet of ore had already been deve showed a grade comparable with that of any ore in the mine. When this level was first opened it was rumored that the ore was unpayable, so that this statement of the management clears the air. It was also stated that the good grade of ore now being obtained might be expected to continue to a depth of at least 2,000 feet. On the West workings of the 800-foot level ore averaging $40. a ton is being developed, with sections running as high as $100 a ton. The 400-foot level, which is being extended into the Orr property, is also developing high-grade ore. 15,000 tons of tailings, running between $4.00 and $5.00 a ton, have been impounded and will be treated later at an estimated cost of from $1.00 to $1.50 a ton, and these tailings have not been included in the estimate of ore reserves. It was announced that the bonded indebtedness, which in August amounted to $176,000, would be paid off on January 1st, the next interest date. At that time the company should have $200,000 cash surplus. The company has under consideration the sinking of a new central shaft and the building of a new mill. This will call for a considerable expenditure and the question of dividends will, no doubt, have to be deferred until the cash assets have been built up sufficiently to permit of this heavy expenditure.

An electrically driven mining plant has arrived at the Kirkland Townsite, which is under option to Anglo-Canadian Explorers, Limited. This will be set up and shaft sinking started. Several diamond-drill holes have been put down and two sections, carrying encouraging values, have been located.

An unfortunate situation has arisen in connection with the Murray-Mogridge property, on which it was recently stated that an option had been taken by the Tonopah Mining Company. It now appears that some time ago an option was given to English interests and that the subsequent option was given to the Tonopah Mining Company without their knowledge. The property is understood to have a good deal of merit, and it is unfortunate that such a condition should have arisen.

BRITISH COLUMBIA

Coal Mines Regulation Act

It is announced that the "Coal Mines Regulation Act" of British Columbia is to be amended at the Session of the Provincial Legislature now in progress to provide that all cases of ignition of gas or dust underground, all cases of fire underground, all cases of breakage of ropes, chains, or other gear by which men are lowered or raised, all cases of overwinding cages, all cases of inrush of water from old workings and any other dangerous occurrence shall be reported to the Inspector of Mines. At present this is not obligatory unless someone is injured, fatally or otherwise, as a result. Penalties, also, are to be substantially stiffened. If a false statement is made in any report or entry required under the Act the penalty, on conviction, is to be imprisonment for a term not exceeding two years. Anyone found guilty of an infraction against the Act shall, if he be owner, agent, or manager, bring a fine not exceeding $1,000 and, if he be any other person, a fine not exceeding $100. As the Act now reads the respective maximum fines are $100 and $10. It also set out that "if the inspector has given notice of an such offence, then in the case of an owner, agent manager "there will be a further penalty" not exceeding $1,000 and not less than $100 for every da after such notice that the offence continues to committed and in the case of other persons to a fu ther penalty not exceeding $50 for every day afte such notice that the offence continues to be com mitted." These more stringent punishments, no doub are the result of the continuance of both major an minor offences against the Act notwithstanding tha wherever evidence is secured, prosecution has bee instituted.

Sales Tax on Fuel Oil

Those associated with the coal mining industry i British Columbia have been interested in the recen reports of the efforts being made by the Hon. Wm Sloan, Minister of Mines, to induce the Provincial Gov ernment to place a sales tax on fuel oil used in Bri ish Columbia. The minister has taken the position fo years that the production of local coal and the domesti market upon which it chiefly depends are being seriously affected by the growing importations of foreign fuel oil. He has pointed to the decreasing annual output of the coal mines of the Province since the year 1910 and the increasing output of oil on the Pacific Coast in substantiation of his contention. He has pointed to the conversion of locomotives to fuel oil burners, to the installation of fuel oil consuming heating plants in business blocks, to the use of the same fuel to a larger extent than ever in the homes of the people, and has asserted that, if the basic coal industry of the Province is to be maintained, it must have some assistance in its fight against the further constriction of its market. While no official intimation is available it is understood that Mr. Sloan's efforts have been successful and that the Government will give the Legislative Assembly an opportunity of passing on the proposal of the imposition of a small sales tax on imported fuel oil.

Canadian Western Fuel Co., Ltd.

Formal notice has been given of a meeting of the Canadian Western Fuel Co. Ltd. to be held at the office of the Western Fuel Corporation of Canada Ltd. at the City of Nanaimo on Tuesday the 11th December next for the purpose of "having an account laid before them by the liquidator — showing the manner in which the winding up of the said Company has been conducted and the property of the Company disposed of and of hearing any explanation that may be given by the Company."

Canadian Collieries Limited

Lieut.-Col. Charles Villiers has been appointed General Manager of the Canadian Collieries (D) Ltd to succeed the late J. M. Savage. Mr. Thos. Graham who has been performing the duties of General Manager temporarily, will continue with the Company as General Superintendent in charge of operations. Col. Villiers formerly was assistant manager of the Johannesburg Consolidated Investment Co. He was for a time General Manager of the African and European Investment Co. which controls several coal mines of the Transvaal. He also was with the Transvaal Chamber of Mines

Victoria and Vancouver District

Dale L. Pitt, manager of the Premier Mine, Salmon iver, Portland Canal, and Mrs. Pitt are visiting Vic-oria and Vancouver. It is reported by Mr. Pitt that he heavy rains of the early part of November did uch damage to the roads leading from tidewater to he mines of the district. Washouts from the side-ills blocked the road and washed out, in some cases, ridges and culverts. Traffic, however, was only held p for two days, large gangs being put to work on epairs. The new Bear River bridge had a narrow scape some of the false work and piles being carried way. Fortunately the superstructure was not in lace or the effects of the storm would have been erious. Five hundred tons of ore a day are being roduced at the Premier Mine, shipments to the smelter mounting to 300 tons and the concentrator turning ut 200 tons. — The Idaho Group of Mineral claims, tuated on the north fork of the Marmot River, six iles from tidewater and at an elevation of 4,800 feet, highly spoken of as a result of recent development. t is said that 15 tons of high grade ore running over 300 a ton in gold, silver, and lead have been sacked or shipment. In some 375 feet of underground work series of high grade veins are said to have been pened up, one vein having been driven on for a istance of 28 feet. The property is being syndicated ith a view to raising capital for further development. . B. Fugier, president of the Gloria Mining Co., be-eves that this property, located just below the mouth f the Marmot River, will prove attractive from a illing standpoint. The mineralization is extensive nd development is to proceed through the winter.

Tragedy at Princess Royal Island

A double tragedy occurred recently at the mine of he Belmont Surf Inlet Mining Co., Princess Royal sland. Kenneth Brown, a 19 year old youth, em-loyed as sampling assistant to the mine engineer, ell into a tool raise and was instantly killed. Gus aurin, a miner, 25 years, fell a distance of 150 feet nto a stope and died of his injuries some hours later.

Fiddler Creek

J. F. Duthie, who came into prominence among western mine operators through his successful devel-opment of the Henderson Group near Smithers, B.C., s reported to have acquired what is known as the Fiddler Creek Mining Property, 130 miles east of Prince Rupert. It is contemplated spending $150,000 n development and Mr. Duthie looks forward to shipping ore in a few weeks. Surface plant proposed includes a tramway, power plant and mill.

Steel Group

The shipment of several carloads of ore to the Trail Smelter in recent months from the Steele Group of Mineral Claims, owned by the Alice Arm Holdings Co., Ltd., of Vancouver, B.C., has directed attention to this property. It is situated near the Columbia River in East Kootenay and is reached by wagon road from Brisco on the Kootenay Central Ry. The ore is brought down to the bench below by a light aerial tram about 1,200 feet long, from the lower terminal of which it is hauled over the rawhide trail for a distance of about 2 miles to the road. The vein occupied a fault fissure apparently conforming in strike and dip to that of the formation. It can be traced easily for a considerable distance and is thought to be a continuation of the "Lead Queen" vein. Carrying on previous development the present Company has uncovered the vein for a distance of about 65 feet along the strike by a deep open cut, showing an average width of 2 feet of ore consisting of steel grained galena associated with disseminated iron pyrites in highly siliceous gangue. A sample showed a trace of gold, silver 18.1 oz., lead 23.3 per cent and zinc 2.4 per cent. It is said that the Company mined 700 tons of ore between January and March of the present year and that the returns were 5,126 ounces silver and 139,543 pounds lead. The installation of a mill is contemplated.

Rossland Mines

Work on the ore of the Rossland Mines started recently at the Trail concentrator of the Consolidated Mining and Smelting Co. of Canada. The concentrates will be stored until sufficient has been accumulated for a run of the copper furnace at the smelter. Until the necessary tonnage is available the copper rod mill at Trail cannot be operated. If the Copper Mountain Mine were to resume work the copper production would be so increased that it would be possible to open the rod mill of Trail and of that there appears to be little present prospect.

Cork Province Mine

The announcement is made that the Cork Province Mine was operated during the month of September at a profit of $5,000. Lack of water is said to be hampering the management, the power available being inadequate. It is proposed that steps be taken to provide the equipment essential to put the company out of reach of such inconveniences in the future.

"Molly Hughes"

The "Molly Hughes Mining Co. Ltd." was incorporated in British Columbia on the 27th October last, its head office being New Denver, B.C., and its capitalization $500,000. The "Jubilee Mining Co. Ltd." is another new incorporation. It made its bow on the 6th November last with a capitalization of $25,000 and head-quarters at Greenwood, B.C.

Chief Engineer Dead

Ethelbert G. Woodford, 73 years of age, and a mining engineer of wide repute, died in Seattle Wn. on the 9th of November. At one time he was chief engineer for one of the large diamond mine corporations of Kimberley, South Africa, and later was engaged in mining engineering work in Alaska.

Trail Smelter

Ore receipts at the Trail Smelter of the Consolidated Mining & Smelting Co., of Canada totalled 4,133 tons. The shipments in detail follow:

Mine	Tonnage
Bounty Frac., Beaverdell	2
Company Mines	3,547
Cork Province, Zwicky	48
Lone Pine, Republic Wn.	57
Ottawa, Slocan, B.C.	19
[illegible]	[illegible]
Quilp, Republic Wn	141
Silversmith, Sandon	91
Standard, Silverton	169
Total	4,133

NOVA SCOTIA

Nova Scotia

The question whether Alberta coal is carried to the far east of Ontario or not it is becoming more evident every day that coke from Nova Scotia will ere long come into close competition with American anthracite and no doubt wrest a fair share of the market from American coal companies. To begin with the market for coke lies in the territory now supplied with Nova Scotia bituminous and a beginning here will lead on to further extension. The collieries of Nova Scotia produce good coking coal for domestic use. They are well developed and capable of filling large orders within a very short time. The ovens are all ready built and there is enough expert information on domestic coke to enable the B.E.S. Co. to go into this work without fear of falling down or even of delay in filling orders. The public have begun to recognize that more can be done in solving the coal problem of Canada by assisting Nova Scotia coal than coal from the West. Distance does not play such a large part in marketing Nova Scotia Coke and when the time arrives that it will become a factor which handicaps, there will be sufficient data gathered to guide in reaching out for further markets if the collieries can supply them. Alberta coal has had its trial, Nova Scotia awaits with calm complacency its turn and if the powers that be are favorable, then with a fair field we ought to win.

Phalen Seam

A bore hole was put down on the Phalenseam at Lingan to test the measures before sinking begins. This seam was struck at a depth of 428 feet. On the way down the hole pierced five different seams, three of these were less than 3 feet thick one was four and the other 5 feet thick. The Lingan seam at the point where entered by the borehole showed 7 feet of clean coal of fine quality. This conclusively proves that the stone band which separates the coal of the rise workings of this seam thins out to nothing to the dip leaving the coal without even a trace of splint or refuse material where the coal comes together. This is exactly the conditions on the other side of Lingan Harbor and proves beyond all question that the Lingan colliery was on the Phalen seam. The new colliery about to be opened up on this seam will be close to the shore line but will have at least over 300 ft. cover where it enters the under-sea areas. The coal gradually dips to the ocean and while the workings are being extended in that direction there may be sufficient land coal to provide a fair output.

BOOK REVIEWS

THE METALLURGY OF IRON AND STEEL, by Bradley Stoughton—third edition, 1923—McGraw-Hill Book Company, 370 Seventh Ave., New York. —520 pages—price $4.00.

During a lifetime devoted principally to the iron and steel industry of his native country, Dr. Stoughton has become its public representative. His book, published first in 1908 and revised in 1911, is a standard text-book on this continent, and has been used widely beyond school and college walls. There is, therefore, a host of old friends who will welcome this 1923 edition of the work, which has been largely re-written, as necessitated by the changes in iron and steel metallurgy during the last twel years.

In his preface to this new edition, Dr. Stoughton d lineates briefly and clearly the trend of the metallurgic development of these years. The growing demand f high-grade iron and steel products, culminating in th specifications for munitions, has stimulated research on scale not dreamed of a comparatively few years ago. Th research has brought improvements and changes in pra tice that in some cases are revolutionary. Neverthele Dr. Stoughton points out a great deal of fundamental re search still is required, if American ferrous metallurgist are to equal their European confrères in providing th great, basic ideas upon which most progress is built. Thi and much more, is reflected in Dr. Stoughton's new boo —for the extensive revision makes it virtually that. W are loath to replace our old friend the 1911 edition, o our shelves, by this newcomer; but we, too, must try t keep up to the times.

GEOLOGIC STRUCTURES, by Bailey Willis—Mc Graw-Hill Book Company, 370 Seventh Ave., Ne York.—295 pages.

An adequate understanding of nature's processes is th foundation upon which is built a large part of our ma terial prosperity. In no sphere of practical endeavou is this more evident than in the work of the mining engi eer and mining geologist. The secret of success in hi case, probably more than in any other, is a correct inter pretation of evidence provided in nature. Dr. Willi book is a detailed study of a phase of geology that is in timately connected with problems the miner must solv He examines the nature of strata, joints, faults, folds an veins and the processes that produce them. Mineral de posits result, to a notable extent, from movements in th solid rock, and to these he devotes particular attentio We commend the book to those who wish to extend or t consolidate their knowledge of this phase of nature's ac tivities.

UNEMPLOYMENT IN GERMAN INDUSTRY

Figures obtained from a reliable source connecte with the Government reflect the seriousness of the em ployment situation in Germany. It is estimated tha on October 16 there were 1,500,000 workers totally un employed in the unoccupied sections of the country In addition to these there were between 4,000,000 an 5,000,000 workers on part time, including 2,000,00 working only half time or less.

The unemployment doles paid by the Governmen and the individual municipalities are totally inadequat to cover the cost of necessities. The maximum allow ance to a married man with wife and two children for the week, ending October 16, was 1,800,000,00 marks a week, whereas a loaf of bread weighing 1,20 grams, cost 480,000,000 marks, a pound of potatoes 50 000,000, and a pound of margarine 900,000,000 at tha time. The minimum allowance for a married man wa 1,400,000,000 marks, for an unmarried man 810,000,000 and for an unmarried woman 600,000,000. It is es timated that the dole received by a worker cover about one-third of the wages he would have received working. For example, a married man with wife an two children received in Berlin for a week of half-tim work 3,100,000,000 marks in wages and a dole of 1,500 000,000 marks.—**Commerce Reports.**

TIN EXPORTED FROM STRAITS SETTLEMENTS DURING AUGUST

Total exports of refined tin from the Straits Settlements amounted to 4,990 long tons in August, compared with 4,865 tons in July. Of the August shipments, the United States took 85 per cent, the United Kingdom 7.3 per cent ,and continental Europe the balance. The highest price for the month of August was $98.25 per picul, against $95.125 for July; the lowest, $92, against $88.50; and the average, $95.04, against $91.46.—U. S. Commerce Reports.

TIN SHIPPED FROM FEDERATED MALAY STATES DURING JULY

The exports of tin ore from the Federated Malay States (72 per cent) during July amounted to 47,009 piculs 30 catties, and aggregated 299,396 piculs 73 catties for the first seven months of 1923, compared with 287,211 piculs 69 catties for the same period in 1922. Tin exports for the month were 7,915 piculs 43 catties, making the total of 55,792 piculs 46 catties for the period January to July inclusive, compared with 57,992 piculs 40 catties for the same months in 1922.—U. S. Commerce Reports.

OUTPUT OF BALDWIN MINES IN BRITISH INDIA REPORTED

The output of the Baldwin Mines in British India during August amounted to 20,161 tons of ore. The refinery produced 3,810 tons of refined lead and 434,680 ounces of refined silver, and the experimental zinc plant, 940 tons of zinc concentrate assaying 9.9 ounces silver, 6 per cent lead, and 48.6 per cent zinc. In addition to this 125 tons of copper matte were produced from accumulated smelter by-products.—U. S. Commerce Reports.

BRITISH EMPIRE EXHIBITION

Viscount Long of Wraxall has accepted the Presidency of the forthcoming Empire Mining and Metallurgical Congress to be held at the British Empire Exhibition on June 3rd to 6th (inclusive) 1924, of which The Prince of Wales is Honorary President. The following official personages have accepted invitations to become Honorary Vice-Presidents of the Congress: The Secretary of State for the Colonies; The Secretary of State for India; The Secretary for Mines; The Prime Ministers of Canada, Australia, New Zealand and Newfoundland; The High Commissioners of the Dominions and British India; and The Lord Mayor of London. The Presidents of the seven Convening Bodies will act as Vice-Presidents and will preside over the Sections with which they are concerned.

BRITISH EXPORTS

Exports of iron and steel products from the United Kingdom for October were 388,599 long tons, the largest month but one (the May total reached 424,509 tons) and 10 per cent greater than the monthly average of 353,500 tons for the nine months of 1923. The products showing a marked increase over previous months were tin plate, with 51,400 tons; galvanized sheets, with 57,800 tons; and sheets and plates, with 50,500 tons.

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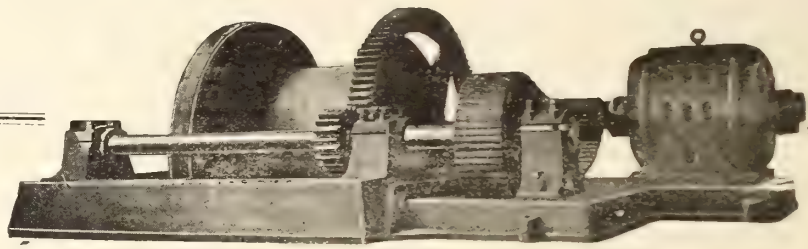

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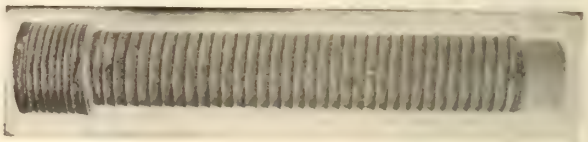

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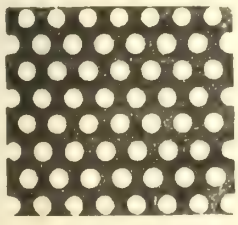

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Castings (Iron and Steel):
Herbert, Alfred, Limited.
Holman, Bros., Ltd.
Hardy Patent Picks Co.
Sam'l Osborn (Canada) Ltd.
Peacock Brothers, Limited.
The William Kennedy & Sons, Ltd.

Cement Machinery:
Hadfields, Limited.
Hull Iron & Steel Foundries, Ltd.
The William Kennedy & Sons, Ltd.

Chains:
Dodge Manufacturing Co.
Jones & Glassco, Reg.
Canadian Link-Belt Co., Ltd.
Greening, B. Wire Co., Ltd.
Powley & Moody, Limited.

Chain Drives:
Jones & Glassco (Regd).
Powley & Moody, Limited.

Chain Drives — Silent & Steel Roller:
Link-Belt Limited.
Hans Renold of Can., Ltd.
Jones & Glassco (Regd.).

Chemist:
Thos. Heyes & Sons.
Milton Hersey Co.
Ledoux & Co.

Classifiers:
The Dorr Company.

Clutches:
Link-Belt Limited.
Hans Renold of Can., Ltd.

Coal:
Dominion Coal Co.
Nova Scotia Steel & Coal Co.

Coal Cutters — Coal Pick Machines:
Sullivan Machinery Co.
Canadian Ingersoll-Rand Co., Ltd.
Hardy Patent Picks Co.
Sam'l Osborn (Canada) Ltd.
Hebert, Alfred, Limited.
Holman Bros., Ltd.
Peacock Brothers, Limited.

Coal Crushers & Conveyors:
Link-Belt Limited.
Peacock Brothers, Limited.

Coal Mining Machinery:
Canadian Ingersoll-Rand Co., Ltd
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co. Ltd.
Hadfields, Limited.
Hendrick Mfg. Co.
Hebert, Alfred, Limited.
Holman Bros. Ltd.
Powley & Moody, Limited.
Sullivan Machinery Co.

Coal Screening Plants:
Link-Belt Limited.
Canadian Mead-Morrison Co.

Cobalt Oxide:
Deloro Smelting & Refining Co., Ltd.

Compressors — Air:
Belliss & Morcom, Ltd.
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Denver Rock Drill Mfg. Co.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Laurie & Lamb.
Smart-Turner Machine Co.
Peacock Brothers, Limited.

Concentrating Tables:
Herbert, Alfred, Limited.
Holman Bros., Ltd.
The Mine & Smelter Supply Co.

Concrete Mixers:
Canadian Fairbanks-Morse Co., Ltd.
Gould, Shapely & Muir Co., Ltd.

Condensers:
Canadian Ingersoll-Rand Co. Ltd.
Belliss & Morcom, Ltd.
Laurie & Lamb.
Peacock Brothers, Ltd.

Condensers — Electrical Static & Power:
Griswold & Co.

Consulters and Engineers:
Milton Hersey Co., Ltd.

Conveyors:
Link-Belt Limited.
Canadian Mead-Morrison Co.
Jones & Glassco (Regd.).

Conveyor Belts:
Canadian Fairbanks-Morse Co., Ltd.
Gutta Percha and Rubber, Ltd.

Conveyor Flights:
Hendrick Manufacturing Co.

Conveyor — Trough — Belt:
Dodge Manufacturing Co.
Link-Belt Limited.
Hendrick Mfg. Co.
Jones & Glassco, Regd.

Copper:—
Consolidated Mining & Smelting Co.

Countershaft Fixtures:
Dodge Manufacturing Co.

Couplings:
Dodge Manufacturing Co.
Hans Renold of Can., Ltd.

Cranes:
Link-Belt Limited.
Canadian Mead-Morrison Co.
Peacock Brothers, Limited.

Crane Ropes:
Allan Whyte & Co.
Canada Wire & Cable Co.
Greening B., Wire Co., Ltd.

Crucibles:
The Mine & Smelter Supply Co.

Crusher Balls:
Canada Foundries & Forgings, Ltd.
Herbert, Alfred, Limited.
Holman, Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
Peacock Brothers, Limited.
The William Kennedy & Sons, Ltd.

Crusher Jaws:
Canadian Steel Foundries, Ltd.
The William Kennedy & Sons, Ltd.

Crushing Rolls:
Canadian Steel Foundries, Ltd.
The William Kennedy & Sons, Ltd.

Crushers — Jaw & Gyratory:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
Lymans, Limited.
The Mine & Smelter Supply Co.
Hadfields, Limited.

Cut Gears:
Hans Renold of Can., Ltd.
Jones & Glassco, Regd.
The William Kennedy & Sons, Ltd.

Cyanide:

Cyanide Plant Equipment:
The Dorr Co.
The Mine & Smelter Supply Co.

Diamond Drill Contractors:
Smith & Travers
Sullivan Machinery Co.

Diesel Engines:
Belliss & Morcom, Ltd.
Canadian Fairbanks-Morse Co., Ltd.
Laurie & Lamb.
Lammers & Maase, Ltd.

Dies:
Canada Foundries & Forgings, Ltd
Herbert, Alfred, Limited.
Hull Iron & Steel Foundries, Ltd.
Holman Bros., Ltd.

Dredging Ropes:
Allan Whyte & Co.
Greening, B. Wire Co., Ltd.

Dredges:
Canadian Mead-Morrison Co.

Dredger Pins:
Hull Iron & Steel Foundries, Ltd.

Dredging Machinery:
Hadfields, Limited.
Hull Iron & Steel Foundries, Ltd.

Drills — Air and Hammer:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Herbert, Alfred, Ltd.
Hardy Patent Picks Co.
Sam'l Osborn (Canada) Ltd
Holman Bros., Ltd.
Sullivan Machinery Co.
The Mine & Smelter Supply Co.

Drills — Core:
Canadian Ingersoll-Rand Co., Ltd.
Herbert, Alfred, Limited
Holman Bros., Ltd.
Sullivan Machineery Co.

Drill Steel Furnaces:
Canadian Ingersoll-Rand Co., Ltd.
Denver Rock Drill Mfg. Co
Hardy Patent Picks Co
Sam'l Osborn (Canada) Ltd
Herbert, Alfred, Limited
Holman Bros., Ltd.
Sullivan Machinery Co.

Drills — Diamond:
Sullivan Machinery Co.

Drill Steel — Mining:
Canadian Ingersoll-Rand Co., Ltd.
Hadfields, Limited
Mussens, Limited

Drill Steel Sharpeners:
Canadian Ingersoll-Rand Co., Ltd.

Drills — Electric:
Canadian Fairbanks-Morse Co., Ltd
Herbert, Alfred, Limited
Holman Bros. Ltd.
Sullivan Machinery Co.
Northern Electric Co., Ltd.

Drills — High Speed and Carbon:
Canadian Fairbanks-Morse Co., Ltd
Hadfields, Limited
Hardy Patent Picks Co.
Sam'l Osborn (Canada) Ltd.
Herbert, Alfred, Limited
Holman Bros, Ltd.

Ejectors:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd.

Electric Condensers:
Griswold & Co.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Herbert, Alfred, Limited
Holman Bros., Limited
Northern Canada Supply Co

Electric Hoists:
Canadian Fairbanks-Morse Co., Ltd
Canadian Mead-Morrison Co

Elevators:
Dodge Manufacturing Co
Canadian Machinery Co
Sullivan Machinery Co
Link-Belt Limited.
Northern Canada Supply Co
Hadfields, Limited.
Jones & Glassco (Regd.).

Engineering & Surveying Instruments:
Laurie & Lamb.

Engines — Ventilating:
Canadian Sirocco Co., Ltd.

Engines, Diesel:
[illegible]
Bellis & Morcom Ltd.
Laurie & Lamb
Lammers & Maase, Ltd.

Engines — Gas and Gasoline:
[illegible]
Belliss & Morcom, Ltd.
Sullivan Machinery Co.
Gould, Shapely & Muir Co., Ltd.
Laurie & Lamb.
[illegible]
Powley & Moody, Limited.

Engines — Haulage:
Canadian Fairbanks-Morse Co., Ltd.
[illegible]
Powley & Moody, Limited.

Engines — Steam:
[illegible]
Canadian Ingersoll-Rand Co., Ltd.
[illegible]

Engineers:
Dresser, John A.
Dorr Co.
Ferrier, W. F.
Hore, R. E.
Heves & Sons, Thos.
Hersey Co. Ltd., Milton
McEvoy, James C.
Rogers, George R.
Ross, Jas. G.
Stewart, Robert H.
Tyrell, J. B.
Whitman, Alfred B.
Wilson, Ridgeway R.

Exhauster:
Canadian Sirocco, Ltd.

Ferro-Alloys (all Classes):
Canadian Steel Foundries, Ltd.

Fire Fighting Supplies:
Canadian Fairbanks-Morse Co., Ltd.
Gutta Percha & Rubber, Ltd.

Flood Lamps:
Northern Electric Co., Ltd.

Flotation Oil:
Hercules Powder Co.

Fluorspar:
Consolidated Mining & Smelting Co.
Everitt & Co.

Forging:
Canada Foundry & Forging, Ltd.
Herbert, Alfred, Limited
Holman Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
Smart-Turner Machine Co.

Friction Clutches:
Canadian Fairbanks-Morse Co., Ltd.
Dodge Manufacturing Co.

Frogs: — See Switches & Turntables
Canadian Steel Foundries, Ltd.
Hull Iron & Steel Foundries.
John J. Gartshore.

Furnaces — Assay:
Lymans, Limited.
Mine & Smelter Supply Co.

Gasoline Extraction Compressors:
Canadian Ingersoll-Rand Co., Ltd.
Sullivan Machinery Co.

Gasoline Tanks — See Tanks:
Can. Chicago Bridge & Iron Co., Ltd
Horton Steel Works, Ltd.
Hendrick Manufacturing Co.

Gaskets:
Gutta Percha & Rubber, Ltd.

Gears:
Hans Renold of Canada, Ltd.
Jones & Glassco, Regd.
The William Kennedy & Sons, Ltd.

Gears (Cast):
Link-Belt Limited.
The William Kennedy & Sons, Ltd
Hull Iron & Steel Foundries, Ltd.

Gears: Machine Cut:
The Hamilton Gear & Machine Co.
The William Kennedy & Sons, Ltd.

Gold Refiners:
Goldsmith Bros.

Gold Pans:
Can. Chi. Bridge & Iron Works, Ltd.
Horton Steel Works, Ltd.

Grab-Buckets:
Canadian Mead-Morrison Co.

Hangers:
Canadian Fairbanks-Morse Co., Ltd.
Dodge Manufacturing Co.

Hose:
Canadian Fairbanks-Morse Co., Ltd.
Goodyear Tire & Rubber Co.
Gutta Percha & Rubber, Ltd.
Dunlop Tire & Rubber Co.

Hangers and Cables:
Stan. Underground Cable Co., Ltd.

Heating Systems:
Canadian Sirocco Co., Ltd.

High Speed Steel:
Hadfields, Ltd.
Hardy Patent Picks Co.
Sam'l Osborn (Canada) Ltd.

Hoists — Air, Electric and Steam:
Canadian Ingersoll-Rand Co., Ltd.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Dodge Manufacturing Co.
Herbert, Alfred, Ltd.
Holman Bros., Ltd.
Jones & Glassco, Regd.
Mine & Smelter Supply Co.
Link-Belt Limited.
Peacock Bros., Ltd.
Sullivan Machinery Co.

Hoisting Towers:
Canadian Mead-Morrison Co

Hoppers:
Dodge Manufacturing Co.

Hydraulic Machinery:
Hadfields, Ltd.
Belliss & Morcom, Ltd.
Laurie & Lamb.
The William Kennedy & Sons, Ltd.

Industrial Chemists & Inspectors:
Hersey, M. & Co., Ltd.

Insulating Compounds:
Standard Underground Cable Co.

Jacks:
Canadian Fairbanks-Morse Co., Ltd.
Northern Canada Supply Co.

Jaw & Gyratory Crushers, See Crushers:

Lamp-Miners:
Northern Electric Co.
Peacock Bros., Ltd.
Powley & Moody, Limited.

Lead (Pig):
Consolidated Mining & Smelting Co.

Link Belt — See Chain Drives:

Locomotives (Steam Compressed Air and Storage):
Canadian Ingersoll-Rand Co., Ltd.
Laurie & Lamb.
Powley & Moody, Limited.

Machine Guards:
Greening, B. Wire Co., Ltd.

Magnesium Metal:
Hull Iron & Steel Foundries, Ltd.

Manganese Steel, See Steel, Manganese:
Canadian Steel Foundries, Ltd.
Hadfields, Ltd.
Hardy Patent Picks Co.
Sam'l Osborn (Canada) Ltd.

Metal Merchants:
Consolidated Mining & Smelting Co.
C. L. Constant Co.

Metallurgical Engineers:
The Dorr Co.

Metallurgical Machinery:
Dwight & Lloyd Sintering Co
The Dorr Co.
The Mine & Smelter Supply Co.

Metal Work, Heavy Plates:
Can. Chicago Bridge & Iron Co., Ltd
Horton Steel Works, Ltd.
Hendrick Manufacturing Co.
The William Kennedy & Sons, Ltd
Powley & Moody, Limited.

Mica:
Everitt & Co.

Mine Cars — See Cars, Mine:
The William Kennedy & Sons, Ltd.
Powley & Moody, Limited.

Mining Engineers:
Hersey, M. & Co., Ltd.

Mining Requisites:
Dominion Wire Rope Co., Ltd.
Hadfields, Limited.
Hull Iron & Steel Foundries, Ltd
Powley & Moody, Limited.

Mining Ropes — See Cable:

Mine Surveying Instruments:
C. L. Berger & Sons.

Molybdenite:
Everitt & Co.

Motors:
Canadian Fairbanks-Morse Co., Ltd.
Peacock Brothers, Ltd.
Powley & Moody, Limited.

Motor Pulleys:
Canadian Fairbanks-Morse Co., Ltd.
Dodge Manufacturing Co.

Nickel:
The Mond Nickel Co., Ltd.

Oil Engines — Reverse:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd.

Oil Storage Tanks — See Tanks:
Can. Chicago Bridge & Iron Co., Ltd.
Horton Steel Works, Ltd.
Hendrick Manufacturing Co.
The Toronto Iron Works, Ltd

Ore Handling Equipment:
Link-Belt Limited.
Canadian Mead-Morrison Co.
Herbert, Alfred, Limited.

Ore Sacks:
Northern Canada Supply Co.

Ore Testing Works: See Assayers & Chemists:

Ores & Metals—Buyers & Sellers of:
Geo. G. Blackwell.
Consolidated Mining & Smelting Co
Everitt & Co.

Oils:
Hercules Powder Co.

Pavers:
Wettlaufers Brothers
Gutta Percha & Rubber, Ltd
Laurie & Lamb

Perforated Metals:
Hendrick Mfg. Co.
Canada Wire & Iron Goods Co
Greening, B. Wire Co

Pillow Blocks:
Canadian Fairbanks-Morse Co., Ltd
Canadian Link-Belt Co., Ltd.

Pipes:
Canadian Fairbanks-Morse Co., Ltd
Consolidated Mining & Smelting Co
The William Kennedy & Sons, Ltd

Pipe — Wood Stave:
Pacific Coast Pipe Co.
Mine & Smelter Supply Co.
Canadian Ingersoll-Rand Co., Ltd.

Piston Rock Drill—see Drills, Air Hammer:

Plate Works:
Can. Chi. Bridge & Iron Co., Ltd.
Hendrick Mfg. Co.
The William Kennedy & Sons, Ltd.
Horton Steel Works, Ltd.

Platinum Refiners:
Goldsmith Brothers.

Pneumatic Tools:
Canadian Ingersoll-Rand Co., Ltd
Herbert, Alfred, Limited.
Holman Bros., Ltd.

Portable Column Hoists: see
Canadian Ingersoll-Rand Co., Ltd
Denver Rock Drill Mfg. Co
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Sullivan Machinery Co.

Poultry Netting:
Greening, B. Wire Co., Ltd.

Power Factor Correcting Devices:
Griswold & Co.

Power Condensers:
Griswold & Co.

Prospecting Mills & Machinery:
Mine & Smelter Supply Co.

Pulleys Shafting and Hangers:
Canadian Fairbanks-Morse Co., Ltd
Dodge Manufacturing Co.
The William Kennedy & Sons Ltd

Pulleys — Iron, Steel, Wood Split:
Dodge Manufacturing Co.
Canadian Fairbanks-Morse Co., Ltd

Pulverizers — Laboratory:
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Mine & Smelter Supply Co.

Pumps — Pneumatic:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd.
Smart-Turner Machine Co.
Sullivan Machinery Co.

Pumps — Steam:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd
Northern Canada Supply Co
Peacock Brothers, Ltd.
Smart-Turner Machine Co

Pumps-Turbines:
Canadian Fairbanks-Morse Co., Ltd
Smart-Turner Machine Co.
Canadian Ingersoll-Rand Co., Ltd
Laurie & Lamb.
Peacock Brothers, Ltd.

Pumps-Vacuum:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd
Smart-Turner Machine Co.
Peacock Brothers, Ltd.

Pumps — Boiler Feed:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd
Peacock Brothers, Ltd.

Pumps — Centrifugal:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd
Laurie & Lamb.
Peacock Brothers, Limited.
Smart-Turner Machine Co.

Pumps — Diaphragm:
Canadian Fairbanks-Morse Co., Ltd
The Dorr Company.
The William Kennedy & Sons, Ltd

Pumps — Electric:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd
Laurie & Lamb
Peacock Brothers, Ltd
Smart-Turner Machine Co

Pumps — Sand & Slime:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd
Laurie & Lamb.
Mine & Smelter Supply Co
Sylvester Mfg. Co., Ltd

Pumps — Valves:
Canadian Fairbanks-Morse Co., Ltd
Peacock Brothers, Ltd

Push Cars — See Cars, Push:
Canadian Fairbanks-Morse Co., Ltd
Powley & Moody, Limited

Quarrying Machinery:
Canadian Ingersoll-Rand Co., Ltd.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Sullivan Machinery Co.

Quills:
Dodge Manufacturing Co.

Rails:
Canadian Fairbanks-Morse Co., Ltd.
Hadfields, Limited.
John J. Gartshore.
Powley & Moody, Limited.

Refiners:
Goldsmith Brothers

Riddles:
Hendrick Mfg. Co.

Rod Mills:
Mine & Smelter Supply Co.

Roll Shells:
The William Kennedy & Sons, Ltd
Canadian Steel Foundries, Ltd.

Rolls — Crushing:
Canadian Ingersoll-Rand Co., Ltd.
Hadfields, Limited.
Hull Iron & Steel Foundries, Ltd
Herbert, Alfred, Ltd.
Holman Bros. Ltd.
Wettlaufer Bros.

Roller Chain:
Hans Renold of Canada, Ltd.
Link-Belt Limited.
Jones & Glassco, Regd.

Rope — Manilla & Jute:
Dodge Manufacturing Co.
Jones & Glassco, Regd.
Allan, Whyte & Co.

Rope — Wire:
Canadian Fairbanks-Morse Co., Ltd.
Anglo Canadian Wire Rope Co.
Allan, Whyte & Co., Ltd.
Canada Wire & Cable Co.
Canada Wire & Iron Goods Co.
Dodge Manufacturing Co.
Dominion Wire Rope Co., Ltd.
Greening, B. Wire Co.

Rope Transmission Equipment:
Dodge Manufacturing Co.

Saline Refiners:
Goldsmith Brothers.

Samplers:
Canada Metal Co.
Ledoux & Co.
Milton Hersey Co.
Thos. Heyes & Son.
Mine & Smelter Supply Co.

Screens:
Canadian Ingersoll-Rand Co., Ltd.
Greening, B. Wire Co.
Hendrick Mfg. Co.
Canada Wire & Iron Goods Co.

Screens — Cross Patent Flanged Lip:
Hendrick Mfg. Co.

Screens — Perforated Metal:
Hendrick Mfg. Co.

Screens Shaking:
Link-Belt Limited.
Hendrick Mfg. Co.

Screens — Revolving:
Link-Belt Limited.
Hendrick Mfg. Co.
The William Kennedy & Sons, Ltd.

Separators:
Smart-Turner Machine Co.
Mine & Smelter Supply Co.

Se er Pipes:
Wettlaufer Bros.

Shafting:
Canadian Fairbanks-Morse Co., Ltd.
Dodge Manufacturing Co.

Sheet Metal Work:
Hendrick Mfg. Co.

Sheaves:
Dodge Manufacturing Co.

Sheets — Genuine Manganese Bronze:
Hendrick Mfg. Co.

Sheets and Dies:
Hull Iron & Steel Foundries, Ltd.
Peacock Brothers, Ltd.
The William Kennedy & Sons, Ltd.

Ship Loaders: see Conveyors
Canadian Mead-Morrison Co.

Silent Chain: See Chain Drives
Powley & Moody, Limited.
Silent & Steel Roller—See Roller Silent Steel.

Sledges:
Canada Foundries & Forgings,

Sleeves:
Dodge Manufacturing Co.

Sintering:
Dwight & Lloyd Sintering Co., Inc.

Smelters:
Goldsmith Bros.

Smoke Stacks:
Can. Chicago Bridge & Iron Co., Ltd.
Horton Steel Works, Ltd.
Hendrick Mfg. Co.
The William Kennedy & Sons, Ltd.

Special Machinery:

Spelter:
The William Kennedy & Sons, Ltd.
Consolidated Mining & Smelting Co.

Sprockets:
Canadian Fairbanks-Morse Co., Ltd.
Hans Renold of Canada, Ltd.
Canadian Fairbanks Morse Co., Ltd.
Dodge Manufacturing Co.
Link-Belt Limited.
Jones & Glassco, Regd.
The William Kennedy & Sons, Ltd.

Spring Coil & Clips Electric:
Canadian Steel Foundries, Ltd

Stamp Batteries:
Herbert, Alfred, Limited.
Holman Bros., Ltd.

Stamp Forgings:
Canada Foundries & Forgings, Ltd.
Hull Iron & Steel Foundries.

Steel Barrels:
Smart-Turner Machine Co.

Steel Castings:
Canadian Steel Foundries, Ltd.
Canadian Brakeshoe Co., Ltd.
Hull Iron & Steel Foundries, Ltd.
Hadfields, Ltd.
Hardy Patent Picks Co.
Sam'l Osborn (Canada) Ltd.
The William Kennedy & Sons, Ltd.
Denver Rock Drill Mfg. Co., Ltd.
Sullivan Machinery Co.
Peacock Brothers Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Canadian Mead-Morrison Co.

Steam Hoisting Engines:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Mead-Morrison Co

Steel Drums:
Smart-Turner Machine Co.

Steel Manganese:
Hadfields Ltd.
Hull Iron & Steel Foundries Ltd.
Canadian Steel Foundries, Ltd.

Steel Plate Construction — Light and Heavy:
Hendrick Mfg. Co.
The William Kennedy & Sons, Ltd.

Steam Engines — See Engines Steam:

Steam Traps:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Sirocco Co., Ltd.
Laurie & Lamb.

Steel-Tool:
N. S. Steel & Coal Co.
Hadfields, Limited.

Stone Breakers:
Holman Brothers, Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Denver Rock Drill Mfg. Co.
Herbert, Alfred, Limited.

Stone Quarrying Machinery:
Canadian Ingersoll-Rand Co., Ltd.
Denver Rock Drill Mfg. Co.
Sullivan Machinery Co.

Structural Steel Work — Light:
Hendrick Mfg. Co.
The William Kennedy & Sons, Ltd

Sulphate of Copper:
The Mond Nickel Co., Ltd.

Surveying Instruments:
C. L. Berger.

Switches:
Canadian Steel Foundries, Ltd.

Tables — Concentrating:
Mine & Smelter Supply Co.

Tanks:
Hendrick Manufacturing Co.

Tanks — Acid:
Hendrick Manufacturing Co.
Ontario Wind Engine & Pump Co.

Tanks — Wooden:
Gould, Shapley, & Muir Co., Ltd.
Ontario, Wind Engine & Pump Co.
Pacific Coast Pipe Co., Ltd.
Mine & Smelter Supply Co.

Tanks, Cyanide, Etc.:
Hendrick Mfg. Co.
Ontario Wind Engine & Pump Co
Pacific Coast Pipe Co.

Tanks — Steel:
Canadian Ingersoll-Rand Co., Ltd.
Hendrick Mfg. Co.
The William Kennedy & Sons, Ltd.

Tanks — Oil Storage:
Hendrick Manufacturing Co.

Tanks — Water & Steel Towers:
Hendrick Manufacturing Co.
Ontario Wind Engine & Pump Co. Ltd

Tires — Auto, Truck and Bicycle:
Canada Foundry & Forgings, Ltd
Gutta Percha & Rubber, Ltd.
Hadfields Ltd
Powley & Moody, Limited.

Track, Manganese Steel:
Canadian Steel Foundries, Ltd.

Trackworks — (Manganese-Steel):
Hull Iron & Steel Foundries, Ltd.
Canadian Steel Foundries, Ltd.

Tramway Points & Crossings:
Hadfields, Limited.

Transformers:
Northern Electric Co., Ltd.

Transmission Appliances:
Canadian Fairbanks-Morse Co., Ltd
Jones & Glassco, Regd.

Transmission Machinery:
Canadian Fairbanks-Morse Co., Ltd.
Link-Belt Limited.
Hans Renold of Canada, Ltd
Jones & Glassco, Regd.
The William Kennedy & Sons, Ltd

Trippers:
Dodge Manufacturing Co

Troughs (Conveyor):
Hendrick Mfg. Co.

Trucks:
Hammant Steel Car & Eng. Works

Tubs:
Hadfields, Limited.
Powley & Moody, Limited.

Tube Mills:
Canada Foundries & Forgings, Ltd
Herbert, Alfred, Limited.
Holman Bros., Ltd.
The William Kennedy & Sons, Ltd
Mine & Smelter Supply.

Tube Mill Balls:
Canada Foundries & Forgings, Ltd
Holman Bros., Ltd.
Herbert, Alfred, Limited.
Hull Iron & Steel Foundries, Ltd
Peacock Brothers, Ltd.
The William Kennedy & Sons, Ltd

Tube Mill Liners:

Turbines — Waterwheel:

Turbines — Steam:
Laurie & Lamb.
The William Kennedy & Sons, Ltd

Turbines:
Belliss & Morcom, Ltd.
Laurie & Lamb.
Herbert, Alfred, Limited.
Hull Iron & Steel Foundries, Ltd
Peacock Brothers, Ltd.
The William Kennedy & Sons Ltd

Turbo Blowers & Compressors:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd

Uranium:
Everitt & Co.

Vacuum Pumps — see Pumps, Vacuum:

Ventilating Systems:
Canadian Sirocco Co., Ltd.

Vises:
Canadian Fairbanks-Morse Co., Ltd
The William Kennedy & Sons, Ltd

Water Jet Drifting Drill:
Canadian Ingersoll-Rand Co., Ltd
Sullivan Machinery Co.

Weights:
Dodge Manufacturing Co.

Wheels and Axles:
Hadfields, Limited.
Hardy Patent Picks Co.
Sam'l Osborn (Canada) Ltd.
The William Kennedy & Sons, Ltd.

Winches — Power Driven:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Mead-Morrison Co.

Winding Engines — Steam & Electric:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd
Herbert, Alfred, Limited
Holman Bros., Ltd.
Anglo-Canadian Wire Rope
Canada Wire & Cable Co. Ltd
Greening, B. Wire Co.

Wire:
Anglo-Canadian Wire Rope
Greening B., Wire Co.

Wire (Bare and Insulated):
Canada Wire & Cable Co., Ltd
Standard Underground Cable Co of Canada Limited

Wire Rope — see Cable:
Allan, Whyte & Co., Ltd.
Anglo Canadian Wire Rope
Canada Wire & Iron Goods Co
Hardy Patent Picks Co.
Sam'l Osborn (Canada) Ltd
Dodge Manufacturing Co.
Dominion Wire Rope Co., Ltd
Greening, B. Wire Co.
Northern Electric Co., Ltd

Wire Rope Fittings:
Anglo Canadian Wire Rope
Canada Wire & Iron Goods Co

Wire Cloth:
Greening, B. Wire Co
Canada Wire & Iron Goods Co

Wire Chains:
Greening, B. Wire Co.

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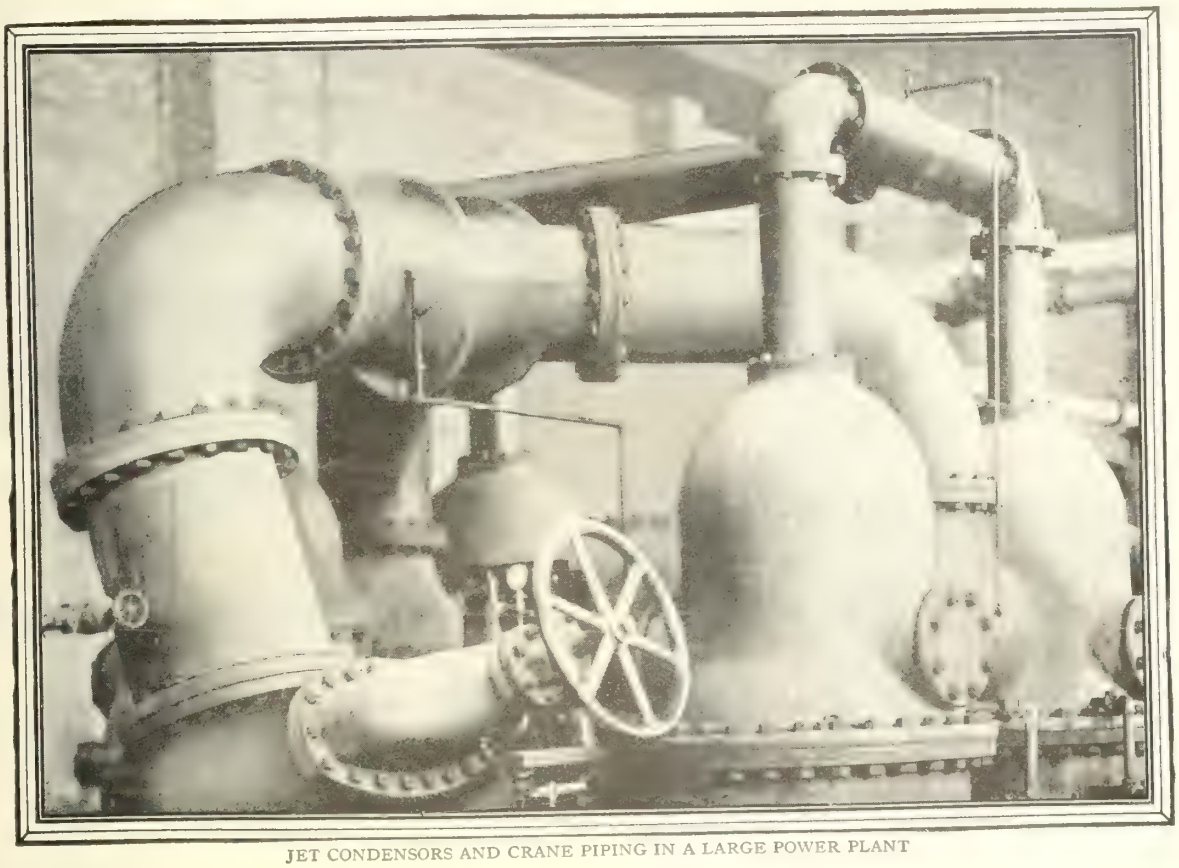

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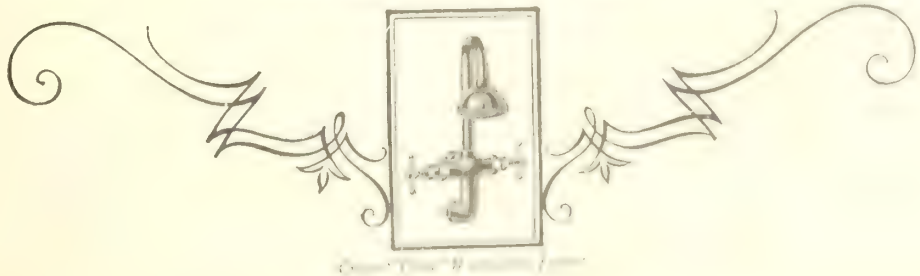
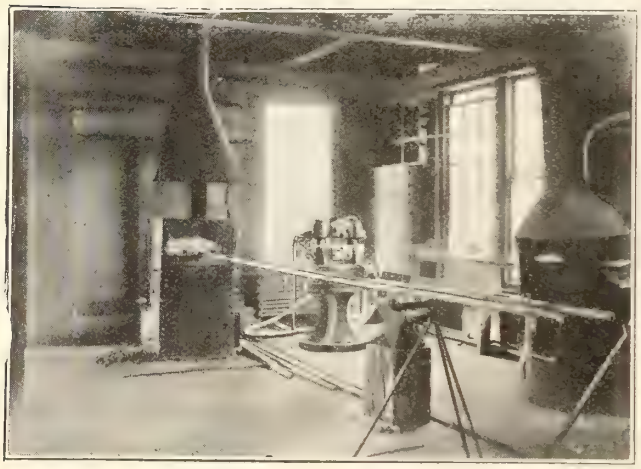


13 "Leyner" Sharpeners under one roof at The Robinson Deep Gold Mines



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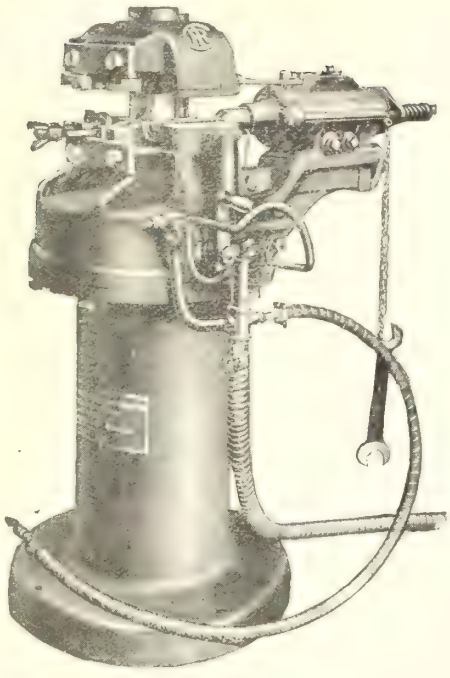

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r Pressure Recommended	70—100	70 -100
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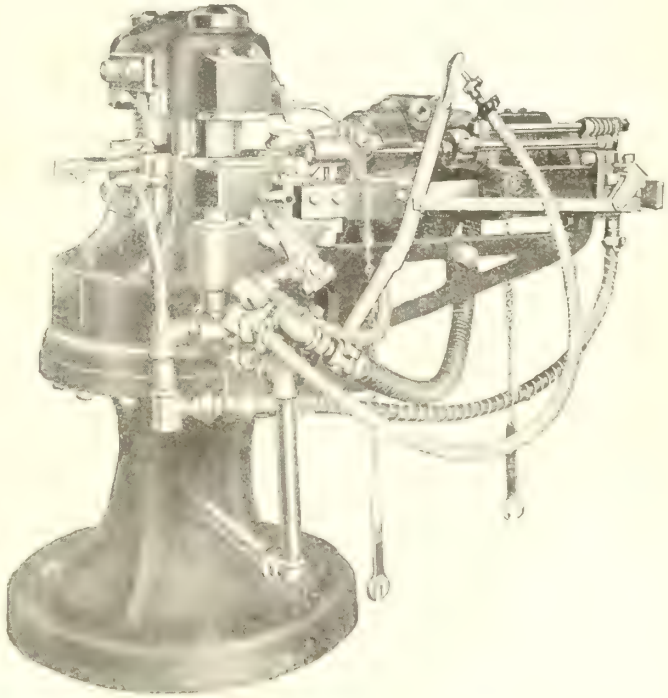

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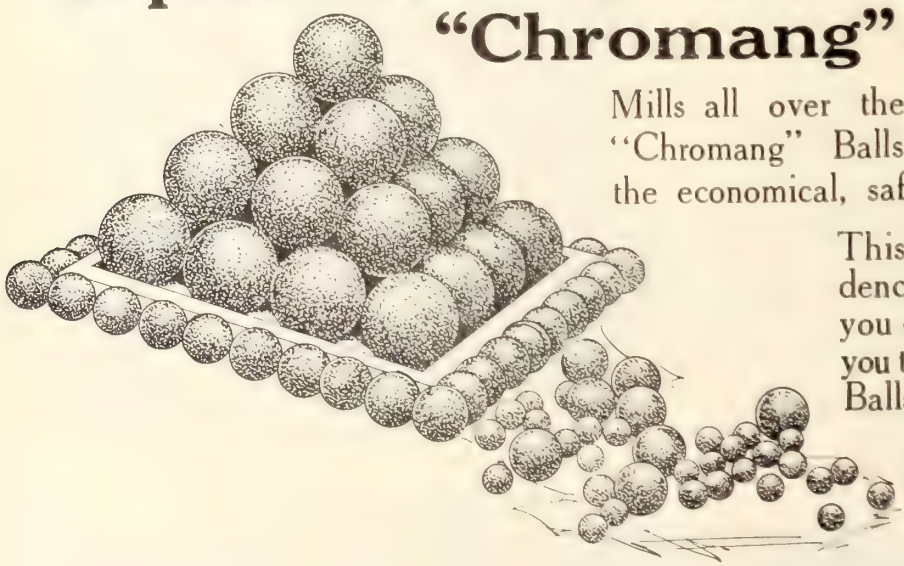

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Ontario's Minerals

PROVINCE OF ONTARIO

Hon. CHARLES. McCREA, Minister. DEPARTMENT OF MINES *Thos. W. Gibson*

Mineral Areas

Ontario, with its 407,262 square miles, contains many millions of acres in which the geological formations are favourable for the occurrence of minerals 70 per cent of the area being underlain by rocks of pre-Cambrian age. The phenomenally rich silver veins of Cobalt, Gowganda and South Lorrain occur in these rocks; so also do the far-famed nickel-copper deposits of Sudbury, the gold of Porcupine and Kirkland Lake, and the iron ore of Magpie and Moose Mountain mines.

Economic Minerals

In addition to the above, practically all economic minerals (coal and tin excepted) are found in Ontario: — actinolite, apatite, arsenic, asbestos, cobalt, corundum, feldspar, fluorspar, graphite, gypsum, iron pyrites, lead, mica, molybdenite, natural gas, palladium, petroleum, platinum, quartz, salt, talc and zinc. This Province has the largest deposits on the continent of talc, feldspar, mica and graphite.

Building materials, such as ornamental marble, limestone, sandstone, granite, trap, sand and gravel, lime, Portland cement, brick and tile, meet every demand.

Mineral Production

Preliminary returns show the output of the mines and metallurgical works of the Province for the year 1922 to be worth $62,202,169, of which the metallic production was $38,190,711.

The following figures show the growth of Ontario's mineral industry by five-year periods since 1891 when a Bureau of Mines was first established.

Year.	Value.	Year.	Value.
1891	$4,705,672	1911	$41,976,797
1896	5,235,003	1916	65,303,822
1901	11,831,086	1918 (Maximum war output)	80,308,972
1906	22,388,383	1921	48,128,387

Dividends.

Dividends and bonuses paid to the end of 1922 amounted to $28,096,699 for gold mining companies, and $86,238,185 for silver mining companies or a total of $114,334,884.

Mining Regulations

A miner's license costs $5.00 per annum, and entitles the holder to stake out in any or every mining division three claims of 40 acres each. After performing 200 days' assessment work on a claim, patent may be obtained from the Crown on payment of $2.50 or $3.00 per acre, depending on location in unsurveyed or surveyed territory.

Assay Office

The Provincial Assays Office at No. 5 Queen's Park, Toronto, is maintained by the Department of Mines for the free identification of minerals, free assays under the provisions of the Mining Act of Ontario, and also for general assay work as per the Schedule of Charges which may be obtained on application.

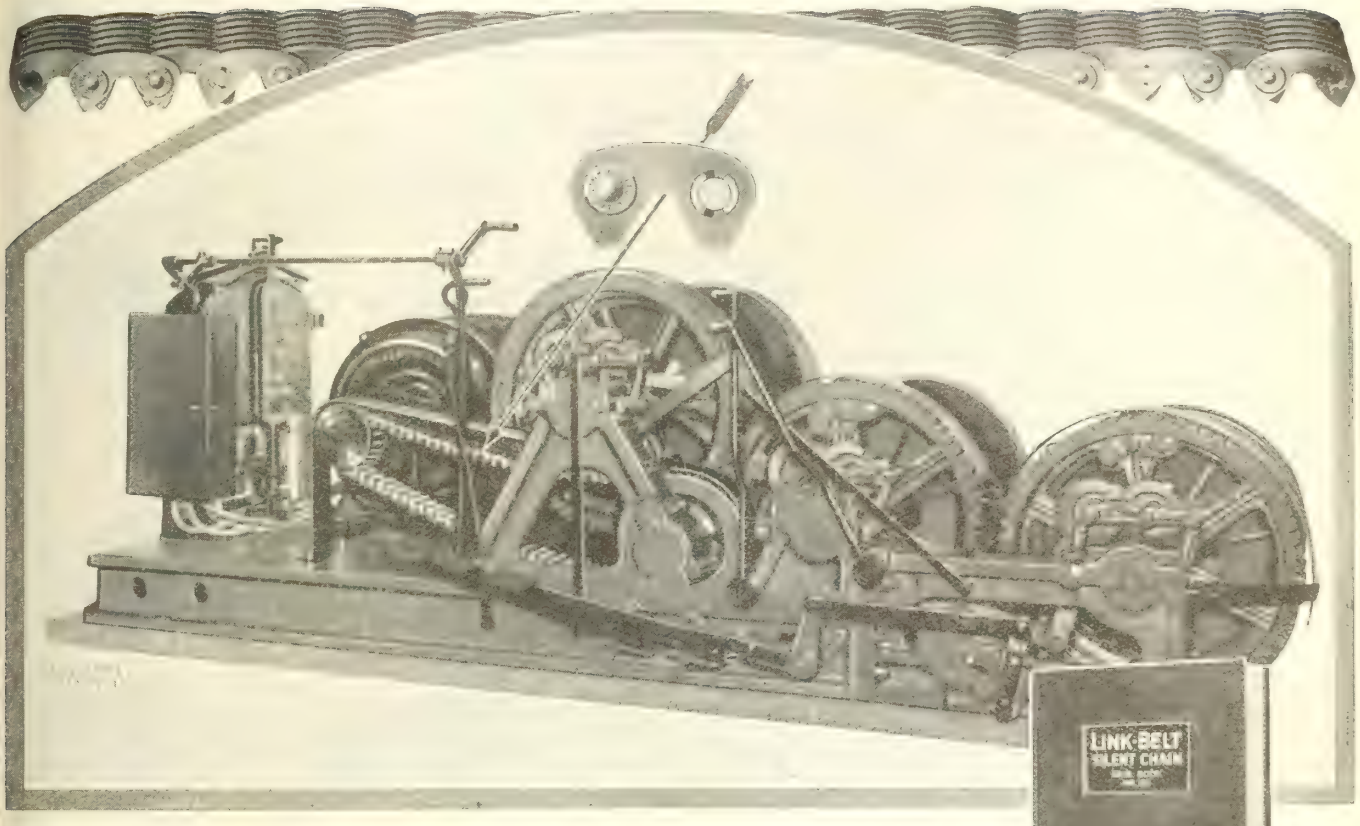
Temiskaming Testing Laboratories

The Department maintains, at Cobalt, an ore sampling and testing laboratory which is now prepared to receive parcels of gold ore from 100 pounds upward, and after sampling and assaying the same to pay to the shipper the value thereof, less treatment charges. The purpose is to afford a market for ores extracted by prospectors and others in developing their mining claims, enabling them to obtain funds which they can use for further work and to report on the most satisfactory method of treatment. Fuller information may be obtained on application to the Manager, Temiskaming Testing Laboratories, Cobalt, Ontario

Publications

For list of publications, illustrated reports, geological maps and mining laws, apply to

Thos. W. Gibson,
Deputy Minister of Mines,
TORONTO, CANADA



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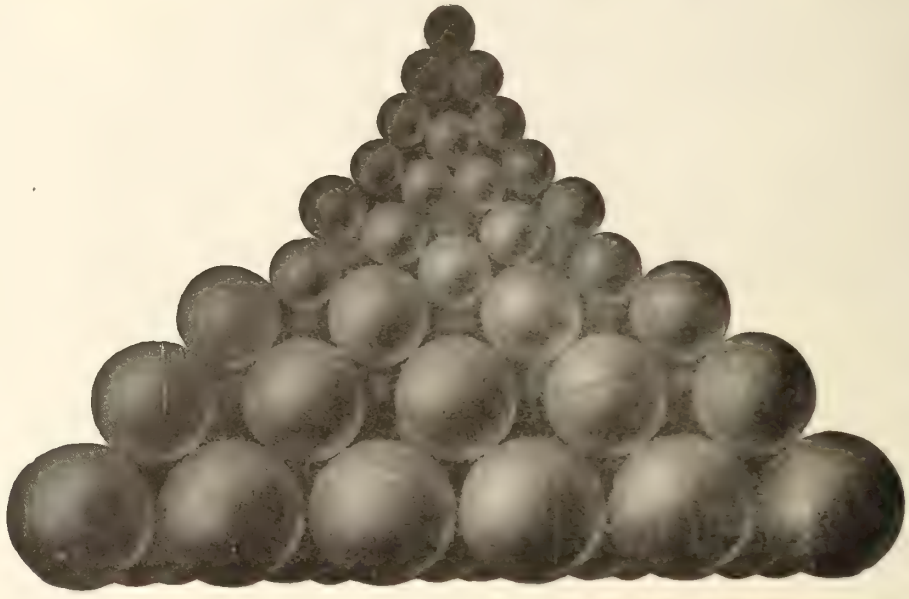

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PUBLISHED WEEKLY

Devoted to the Science and Practice of Mining, Metallurgy and the Allied Industries; and more particularly to their progress in Canada

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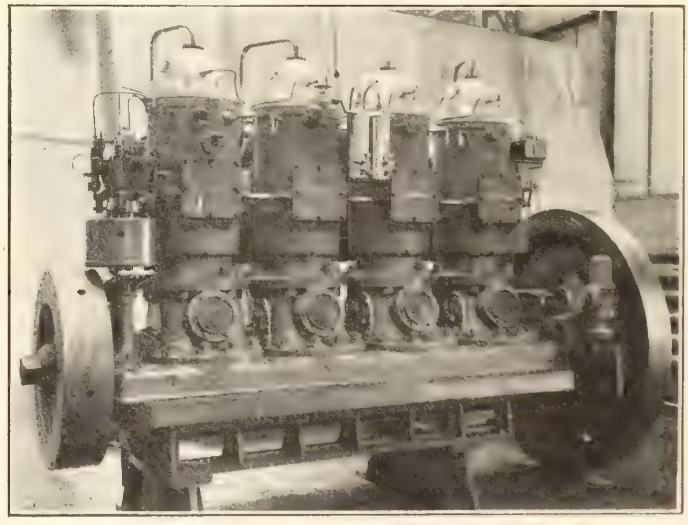

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:-: EDITORIAL :-:

BEGINNER'S LUCK

Here is the story of a greenhorn's luck — or good judgment.

Mr. F. S. Arntfield is a business man of Toronto. Last winter he was caught in the excitement of the Quebec gold boom and bought a claim. Last summer, after the flies had gone, he came north, hired a couple of bushmen and started out to find and examine his embryo gold mine.

The terminus of the canoe route was Renaud Lake, near the Lake Fortune property. From there it was a weary tramp to the claim in the northern part of Boischatel township; and it was not helpful to find that it was the veriest "wild-cat" — mostly swamp, and the rest hopeless for gold.

Instead of returning to Toronto damning the country, the prospectors and all else, as most men do when "stung", Mr. Arntfield determined to do some first-hand prospecting. He visited the Lake Fortune camps and there learned what gold ore and a schisted zone look like. A few days afterward, wandering through the woods within half a mile of his camp, he found schist which proved, first on panning and then on assay, to be gold ore. Stripping corroborated the evidence of the outcrop, and a further search revealed two additional shear zones close by, both gold-bearing as well. Mr. Arntfield then staked his first claim, the date on his discovery post being September 10th, 1923.

Acting on the advice of his new-found friends of the Lake Fortune, Mr. Arntfield kept his find quiet, and by staking and purchase soon had increased his original 180 acres to the respectable total of 2,000 acres, covering two miles along the strike of the shear zone. Then he talked — just a little — and now there is a rush to Boischatel township, and it is staked solid. The Arntfield property is looked upon as "a winner." Thus has the tyro outdone the professional prospector. Some will say it is luck pure and simple; but we know that, mixed with the luck, there is a fund of common sense, an unusual amount of dogged pertinacity, and that insatiable curiosity and constant high hope without which the prospector cannot successfully ply his trade. A good prospector was spoiled when Mr. Arntfield went into business; but he has done his bit for the country's mineral industry within these few weeks, after a well-filled life in another sphere of activity.

There must be many natural-born prospectors wasting their talent in the cities. It would be a good thing for themselves, as it might be also for the mining industry, if these took their vacation (after fly time!) in the north woods instead of Muskoka or Atlantic City. Prospecting in Canada is one of the finest games on earth. There are too few playing the game, and the field is open to all comers.

RESEARCHES IN CRUSHING

Crushing is one of the essential parts of ore-dressing in almost all mining and metallurgical plants, and where a finely divided product is required, it is one of the chief items of expense. It is, therefore, rather astonishing that the development of crushing methods has been left mainly to chance and to the fortuitous inspirations of inventors. The laws of crushing, as so far expounded, are principally of two kinds; either they are formulae developed by mathematical reasoning, and then grafted upon the various crushing operations; or they are empirical statements based, usually upon insufficient and inconclusive experimental data.

It is a pleasure, therefore, to find that Canada is taking a lead in fundamental research on crushing. It has required, as usual, the perception of outsiders to bring us to an adequate realization of what is going on within our own borders. We refer to the work of Professor H. E. T. Haultain and his associates in the University of Toronto. In order to stimulate similar activity in the United States, the American Institute of Mining and Metallurgical Engineers has induced Professor Haultain to undertake a lecture tour, with a view especially to showing his latest series of motion pictures illustrating the action of balls in tube mills. This tour was concluded at the Massachusets Institute of Technology ten days ago, and was a pronounced success.

It is to the good cause of research along these lines that the Hollinger Mines has contributed the substan[illegible] To discover the facts that govern the various processes of crushing, and then to devise mechanisms that will work in accordance with these facts, is a task of no mean proportions. It will require years of patient [illegible] principles, their worth is not so obvious to the out[illegible] public authorities can give it, and its progress will be

speeded up very materially by the added assistance of private corporations.

It is seldom that sound scientific method and a spectacular appearance are found in conjunction, as is the case with Professor Haultain's motion pictures. It is fortunate that this is so, for it will attract widespread attention to the whole problem of crushing with a rapidity that would not otherwise be possible, and will stimulate within a twelvemonth interest that it would take years to induce by more prosaic means.

LOW SALARIES A MENACE TO DEPARTMENT OF MINES

The Ontario Department of Mines' geological staff will soon be at half strength. In September last Mr. Cyril W. Knight resigned to join the staff of the Nipissing Mining Company. Now it is announced that on April 1st next Mr. Percy E. Hopkins will resign to join the Mond Nickel Company. The Company is wise to secure the services of Mr. Hopkins, as he is a born prospector as well as a highly trained pre-Cambrian geologist; but the Department of Mines will find it impossible immediately to replace his services with those of another equally proficient, and it will pay dearly for the loss incurred while a successor is learning his work.

The provincial geologist, Dr. Miller, has had much to do with directing the destinies of Ontario's mineral industry for the past twenty years. Mr. Knight joined him when Cobalt was a prospect, and became assistant provincial geologist. Mr. Burrows joined the field staff in 1907, and has paid particular attention to the Porcupine gold area from the time of its discovery. A year or two later Mr. Hopkins made a fourth in the quartet that have made the geological service of the Ontario government famous, not only throughout Canada, but far beyond. Now Dr. Miller and Mr. Burrows are left to carry on the work and to train the younger men who now must be added to fill the Department's complement.

Both Mr. Knight and Mr. Hopkins have been happy in their work in the public service. It is a fine work, with numerous attractions that commercial employment cannot offer. The reason they have left is, of course, because they can get more pay, probably double, in private employ. At one time during the period of high prices juniors on the staff in Toronto were not being paid a living wage; then a small increase was made to bring salaries over the border line. It is with reluctance that both these geologists have left the public service; but the possibility of earning enough in private employ to provide not only a good living but a competency for the future has proved to be an irresistible attraction.

There are some who say that no government can compete with a private employer for the services of a skilled technologist. We do not believe this to be the case. There can be a considerable discrepancy between the rates of pay in public and private service and, due to its inherent attractions for some men, the public service will hold them. It is only when the difference in the rates of pay is extreme that there will be a wholesale exodus from the public service.

From our present knowledge of the case, we judge that the salaries paid to geologists in the Ontario Department of Mines are inordinately low. It may be that the salaries of geologists cannot be raised unless those of some other departmental officials are raised also. In that case these latter should be adjusted as well. If two more geologists should resign from the staff, there will be no geological force at all. Both have been much sought after at times by private interests, and it is quite possible that the exodus will become complete.

These two resignations have shown that, under the existing policy of the Ontario Department of Mines there is no sufficient assurance that an effective geological staff will be kept together. In the final analysis, it is the Minister of Mines who is responsible for the Department's policy. We hold it to be the urgent duty of Mr. McCrea to investigate this question, and to assure the mining public to whom he is responsible either that it is impossible to raise the salaries of the Department's geologists, or that he has taken steps to see that this will be done.

THE GOLD BELT

In the December issue of the Bulletin of the Institute is printed the unusually thoughtful and able address delivered by Mr. C. M. Campbell at the Trail meeting in October. The admirable features of this address have been referred to before in these columns, as well as those points on which we do not see eye to eye with Mr. Campbell. The future of our mineral industry is a topic of such importance that it will bear discussion at any time. We welcome, therefore, a further statement from Dr. Corless, which appears on another page. In this he sets forth once more a very important point to which Mr. Campbell gives scant attention — the problem of finding the mineral deposits that will make the new mines on which not only the progress but the very existence of the industry depends.

If Mr. Campbell had been with us in Kenyn and Boisehatel townships last week, and had seen what we saw there, we are inclined to believe he would not have discounted the future so severely as has been his wont. True, there is nothing as yet disclosed there that can be added to a national inventory of ore reserves; but the outcrops so far located are such strong evidence of what will be disclosed by underground exploration that one cannot fail to believe that at

least one or two mines will be developed beneath them.

As noted in the description on another page, three small sections in these two townships have been subjected to intensive prospecting during the past season. On the Lake Fortune and adjoining claims this work has been confined to less than 100 acres. On the Noranda groups in Rouyn township a somewhat larger area has been examined. Round Pelletier Lake a dozen patches of land of a few acres each have received attention. In half-a-dozen scattered localities throughout the two townships the ground has been run over by prospectors and a small amount of trenching done. The area of the two townships is 200 square miles, or 128,000 acres. A large part of this is good prospecting ground, on whose outcrops a prospector has never yet set eye. Since the three localities already examined have contained such promising deposits, it seems more than likely that further search in unprospected ground between will disclose more of them.

The two townships of Boischatel and Rouyn cover twenty miles of a gold-bearing belt 100 miles in length. Except for some restricted localities where navigable waterways cross it, no systematic search has been conducted along the remaining 80 miles of this belt. Geologists have determined that, with some possible exceptions towards the eastern end, the whole belt is favourable to the occurrence of gold deposits. If the section so far examined is a fair sample, the future of the 100-mile belt is bright.

So far there has not been a single payable deposit proved on this gold belt. Yet experienced mining men are paying out thousands of dollars a week in the aggregate in development work, firm in the conviction that they will gain a good return. They are spending their money cautiously, as befits good business men; but the outcrops they have stripped and sampled simply compel expenditure on a large scale.

It is the point of view that directs these pioneers in a new mining field that Dr. Corless has exemplified and has defended so well. It is an entirely different point of view, namely that of the plunger or the wild enthusiast, that Mr. Campbell condemns with such fervent enthusiasm. "Inconceivable wealth" is neither here nor there; it is merely a phrase that will serve a useful turn in good hands, or can be much abused in the months of ignorant or scheming persons.

We shall not know before next spring whether or not the present prospects will make mines. It will take years to explore the whole gold belt. Meantime, though two railways are pointed towards the prospective mines, we may rest assured they will not be extended until there is full warrant. And, if the wild-catter can be kept out of the field, we may likewise depend upon the wise expenditure of the money required to find out what the field contains.

It may well happen that there will be won from Quebec's gold belt the wealth of the Rand; or the present evidence may be misleading, and we may have there only a few small gold mines. Whatever the result in this case, those in the mining industry charged with the responsibility of exploration must press forward, not only with the hope but with full assurance that their efforts will be rewarded. It is to aid in the search that Dr. Corless has painted his picture of the future. But at all times we must observe the precautions that guide mining as well as all other enterprises at their best. To emphasize these precautions Mr. Campbell has accepted as his task.

AWARD TO THE LATE J. D. MACKENZIE

It is with particular pleasure that we note the award of the Leonard Gold Medal by the Engineering Institute of Canada in recognition of the outstanding merit of the paper on "The Coal Measures of Cumberland and Vicinity, Vancouver Island," that was presented by the late J. D. MacKenzie at the Annual Meeting of the British Columbia Division of the Canadian Institute of Mining and Metallurgy in February of last year.

J. D. MacKenzie was a man who won the hearts of all who knew him and his work was inspired by genius of enduring value. To pay tribute to such a man is a privilege and we, among his many friends, tender to Mrs. MacKenzie the assurance of the personal gratification the bestowal of this honour has for us.

The paper is published in the Transactions of the Canadian Institute of Mining and Metallurgy for the year 1922, and has already been accepted as the standard work upon the "Island" coalfields.

NEIL R. MACDONALD

The Canadian mining fraternity has lost a picturesque figure in Neil R. MacDonald, who died in Montreal on November 20th of pleuro-pneumonia after a few days of illness. He was little past the prime of life, and had many years before him but for this sudden seizure. It is almost anomalous that he should have passed out in the Canadian metropolis rather than in the camp, military and mining, where he spent so much of his life.

The "Foghorn" is no more. He will be missed at many a gathering where his marvellous vocal power and his equally wonderful gift of expression entertained the whole assemblage. He was known from side to side and from end to end of this continent, and during his term of enlistment, first as a private in the infantry, and then as an officer with the tunnellers, his fame spread abroad in the old land.

"Foghorn" was a Glengarian, and trained for the priesthood at Ottawa College. His impulse for adventure overcame the influence of his training, however, and the woods and the camps soon claimed him for their own. He was always equally at home on the trail and in a drawing-room — though one can hardly say he acceded to all the conventionalities of the latter. His hearty, bluff manners were an attraction to all and compelled attention wherever he went. The "fog-horn" will amuse and entertain his fellows no more, but his memory will long remain with us.

A British Empire Mining Council

Such is the project that the eminent English mining engineer, Mr. Hugh F. Marriott, has been advocating in his original and very practical way, by a voyage around the world, keeping to the British possessions and speaking to large and influential audiences of mining men wherever he has gone. He is now on the home stretch of his long journey, having reached Canada by crossing the Pacific, after visiting Africa, Asia, Australia, and New Zealand. He has seen the mines of British Columbia and Alberta, and a few days ago came to Toronto after seeing the nickel, silver and gold districts of Northern Ontario.

On the invitation of the Toronto Branch of the Canadian Institute of Mining and Metallurgy Mr. Marriott addressed a meeting held in the Convocation Hall of the University on Friday, Nov. 23rd. When the Provincial Geologist, Dr. W. G. Miller, who was chairman of the meeting, led the procession to the platform, it was seen that, as he expressed it in introducing the speaker, "there were present on the platform three distinguished representatives of British mining industries,—Mr. Marriott from the heart of the Empire, the Hon. Mr. McCrea, Minister of Mines of the banner mining province of Canada, and Mr. John Dresser, President of the Canadian Institute of Mining and Metallurgy."

Canada's Influence in Other Dominions

Continuing his introduction, Dr. Miller said he knew a great deal about Mr. Marriott, most of it good. Mr. Marriott had been one of the representative mining men conducted throughout Canada fifteen years ago, and he (Dr. Miller) had had the pleasure of travelling with him at that time. He had also seen him in South Africa where Mr. Marriott had exercised a potent influence not only on mining methods but on the mining policy of the country. At Mr. Marriott's suggestion he had called on General Smuts, who at once asked him questions about Canadian experience with bounties on iron and steel. This inquiry emphasized the way in which the other British Dominions are watching Canada, seeking to learn from and profit by our experience. He learned that South Africa is studying the work of Ontario's Hydro-electric Commission to get hints on transmission of electrical power. South Africa is building great grain elevators, and the contractor is a young Canadian who got his experience in Kingston and Winnipeg. All of this went to show that the British Dominions are being knit together not only by the bonds of sentiment but also by those of industry. And the aim of the speaker of the evening was to promote the latter particularly in connection with mining and metallurgy.

Mr Marriott's Address

Mr. Marriott, a well set up Englishman, who carries lightly his half-century or so of years, spoke of his long experience in the mines of South Africa and of his retirement lately to his farm in Northamptonshire, an inheritance coming down in his family from the time of Henry VIII.

He wished to speak of things that really matter from the Empire point of view. The thing that impressed him most is the value of personal intercourse between the units of the Empire. Difficulties disappeared and unexpected advantages came into view when men got together. That was why he was making this extended tour round the world through the British Dominions.

Value of Inter-Imperial Intercourse

The value of intercourse among representative men was illustrated by the Pan-Pacific Congress. With headquarters in Honolulu, this organization discusses the interests of the countries in and bordering on the Pacific Ocean. It is quietly bringing about a great many improvements in industrial and living conditions. It has been so effective in this respect that it is more than suspected that some of its large projects are being partly financed by governments interested in the improved conditions.

In discussing the recent work of this Congress, Mr. Marriott had occasion to refer to the great organizing ability shown by Dean R. W. Brock of the University of British Columbia. The Australian geologists have done fine work in tracing the geological features for the location of artesian wells, as part of a great scheme for the irrigation of dry belts. The study of communication by radio has been joined in by Japanese, Filipinos, and other eastern nations, and it has developed that there may be a good chance of getting in this way useful forecasts of typhoons and earthquakes. Within the next ten or fifteen years radio-telephony will be so perfected as to knit together the whole empire more effectually than any other advance in science.

In New Zealand much hydro-electric power is being developed, and it is being used freely. For example it is not unusual to see a conducting line several miles long in the country supplying only a two H. P. motor. On these New Zealand farms the cows are milked by machinery. Formerly oil-engines were used, but the farmers say the cows like the gentle purr of the electric motor better than the jug-jug of the engine, and so give more milk.

Canadian Society is Top-Heavy

Mr. Marriott knows Canada fairly well. He admires our very fine organizing ability,—but finds that while we are well organized at the top, we have neglected the bottom—the base of our social structure. Canadians take great pains to educate and provide for the few who do the thinking, but are not so careful to see that the multitude have the best chance for a satisfactory existence.

If Canada wishes to get the farming lands and the mining communities settled by men who will stay and be satisfied, she must take more pains to see that they have the ordinary means of a social life,—such a life as is possible only where there are well organized communities. "Give them a bit of what they are, want or are used to, amusement halls, radio, cinema, music, football, and so on. Then they will stay in the outlying places and not overcrowd the cities."

Opportunities In Canada

In studying the mineral resources of Canada, the speaker was impressed with the unlimited supply of coal in the West. In Alberta, where the mining conditions for coal are unusually favorable, he was told that it could be taken out for $2.00 a ton, if labor conditions were normal; but Canadians are allowing foreign control to run up the price of our own coal to such an extent that we cannot afford to transport it any considerable distance from the mines. In his opinion this state of affairs was greatly retarding the development of Canadian manufactures and other industries. "The way to get ahead is to be self-contained. Cheap coal means cheap power for industries

With that we might have as dense a population as in Belgium."

Canada is the great unoccupied space into which the human race will expand. Let her be afraid to receive no race of real workers. The more men, the better chances for finding among them that peculiar, keen observant type that makes the best prospector. Mineral discovery is difficult and so attracts men of fine characteristics. The indications are that, as time goes on, the prospector will be a man of scientific bent and education.

Ontario is likely to have a greater and steadier mineral development than any other part of the world, and to speed up that development, there is needed the hearty co-operation of prospector, miner, manager, and investor. —each enjoying his share of the work, and each getting enough out of it to give him a contented life.

Mr. McCrea Says All Must Work

The Hon. Mr. McCrea, in moving a vote of thanks to speaker, referred to Canada's lack of organization at the the bottom. We have boundless resources and the possibility of a good living and a satisfactory life for all; but owing to faulty education and other removable causes, everybody wants to be at the top. The educators have given much thought to this subject and will find a way to impresses the fact that spade-work is for us all. We must be workers, the development of natural resources must be wisely and strongly pushed, we should tell the world what we have, and investors should be assured of the stability of our mining laws, and of fair treatment in respect of titles and taxation. During his life in the north country he had felt that our future lies in the expansion of our industries, mining as well as agricultural. He paid a well-deserved tribute to the team work of the Deputy Minister, Mr. T. W. Gibson, and the Provincial Geologist, Dr. W. G. Miller. At the present rate of increase the value of the mineral products of Ontario will have attained in twenty-five years from now to 1,500 million dollars.

The great Empire Exhibition of 1924 should do much to forward Mr. Marriott's idea of co-operation in the mineral development of the Empire. It is to be hoped that at the same time something may be done to bring up Canada's coal, oil, and iron ore production to the favorable position shown by her output of nickel, silver, and gold.

Mr. Dresser Honors the Pioneers

The President of the Institute spoke of Mr. Marriott's part in initiating the Imperial Mineral Resources Bureau, of which Dr. Miller is an influential member. Doubtless the idea now being worked on by Mr. Marriott was an outcome of the activities of this Bureau, namely, an Empire Mining Council to connect all its mining and metallurgical societies. Mineral industries will progress in proportion to the increase in our knowledge of our country. To this end we need many explorers and improved transportation, and more appreciation of the pioneer's work by those who conduct the business of the great centres of population. Mr. Dresser cited the case of Toronto, attributing a great part of its recent growth and prosperity to the development of the mineral and agricultural industries of the north. The pioneers who hesitantly built the railway that made possible this development should be suitably honored and remembered.

NEW ARCTIC MAP

The Geological Survey, Ottawa, has issued Map No. 1963, showing the geography and geology of the Arctic coast on both sides of the Coppermine River for a distance of 200 miles, on a scale of 10 miles to the inch. The area has large tracts underlain by pre-Cambrian rocks, as well as Silurian and later series.

NEW USES FOR SILVER.

Systematic study of silver and its alloys should result in its wider use in at least two fields, with strong probability of similar results in other directions, according to a report submitted by the U. S. Bureau of Mines to Secretary Work of the Interior Department in response to his recent request for a preliminary study of possible new uses for silver in commerce and industry. The possibility of developing a non-tarnishing silver for use in tableware and the arts and of finding silver alloys suitable for trimming automobiles were set forth as the two fields in which a systematic investigation should result in a wider use of silver.

"Silver has been allowed to fit into places where it would satisfy the requirements, and little systematic research to develop new uses has been done," the Bureau of Mines' report stated. "Such research, therefore, has a better chance of success than if the field already had been extensively investigatel. Although individual producers and fabricators have not overlooked the possibilities of such studies, it is believed that the situation now has reached a stage where, under govermental direction, these individual investigations could be co-ordinated into a systematic plan of research to increase the commercial and industrial use of silver.

"One of the major possibilities would be through the development of new alloys. It is well known that a small percentage, in many cases only a fraction of 1 per cent, of one metal alloyed with another changes the properties of the latter greatly. Everyone is familiar with the decided change in appearance caused in copper by the addition of a small percentage of nickel, as well as with the decided change in properties of steel caused by the addition of very small percentages of non ferrous metals. It is entirely possible that a systematic investigation would develop alloys of silver which would have most desirable properties for use industrially or commercially.

"One of the chief drawbacks to the use of silver for household articles it that it readily tarnishes. If this could be evercome or materially decreased by means of the development of an alloy which would not be excessively expensive, it should result in a great increase in the use of silver articles and, in turn, in a large increase in amount of silver consumed.

"It is known that certain metals, including cadmium, when alloyed with silver reduce its susceptibility to tarnish. This is mentioned merely as an example. It is entirely possible that other metals or combinations of other metals with silver would form an alloy less susceptible to tarnish, if not non-tarnishable, under ordinary conditions.

"There is further the possibility of developing relatively cheap alloys in which only a small proportion of silver will be used which, due to the large consumption of such alloys, would result in a large increase in the amount of silver consumed. Silver-aluminum alloys deserve consideration in this connection. One of the [illegible] which such alloys might be put would be that of trimming on automobiles. A silver alloy relatively non-tarnishable and solid throughout would have decided advantages over the present nickel-plated trim. The investigation of the possibility of producing such an alloy is worthy of consideration."

The Quebec Gold-Field

Present Conditions in Rouyn and Boischatel Townships

(By the EDITOR)

A visit, just concluded, to the active sections of the Rouyn-Boischatel gold area of northwestern Quebec shows substantial progress since last I was in the region in September. Work on the properties that have reached the stage of diamond-drilling and shaft sinking is progressing steadily. At least one new property has been added to the list of prospective mines, and a number of promising prospects have been uncovered as a result of work late in the season. I shall describe these developments briefly. There are bound to be some properties meriting mention that I have not included here; this is merely because I lack information about them.

The Noranda Groups

The first and best known claims are the groups in the northwest part of Rouyn townships held by Noranda Mines. The Powell vein, on which such high hopes were centred a year ago, has been rather overshadowed since intensive prospecting last summer disclosed the huge body of gold-bearing breccia on the Chadbourne group two miles to the south. The fact that Nipissing Mines has taken over the Powell group of claims is sufficient to indicate that the Powell is worth exploring by shaft and drifts. Surface work and diamond-drilling have been the only development on the vein so far. A force of miners has been sent in and sinking will be conducted by hand until the requisite machinery is brought in over the winter roads.

The interest of the Noranda Mines management in their Powell vein was diminished suddenly when the Chadbourne deposit was brought to light. It is on the northern part of the Chadbourne claim, the southermost of the group. The outcrop is a rounded hill, thirty-five feet high, of pear-shaped outline, 600 feet by 300 feet, with the large end southward, completely surrounded by swamp. The whole of this hill is gold-bearing, and the extension under the swamp is as yet undetermined. Five hundred feet to the south trenching shows material of the same variety, with volcanic flows close by.

The ore is unique, consisting of brecciated lava from large blocks down to small fragments, cemented with quartz and carbonates, all being impregnated with pyrite. Payable ore of good grade has been determined in various parts of the hill. A shaft has been put down 50 feet in the ore, and as soon as the winter roads allow of moving the heavy machinery from the Powell claims, it will be continued to 150 feet and lateral work pushed in all directions to delimit and explore the ore-body. Should the vertical extension of the ore and its value correspond to the outcrop, a mine of large dimensions will be assured. What is hidden by the swamp, only underground development will determine.

Diamond-drilling continues on the Horne claims, east of the Powell and Chadbourne groups, with one drill. One or more drills in addition will be used to block out the bodies of copper-gold ore indicated at present by the outcrops and two drill holes. The ore disclosed so far is of good smelting grade.

Pelletier Lake Prospects

Exploration on the above three properties is being conducted on a comprehensive scale, with the expenditure of considerable sums of money. The other discoveries in the township of Rouyn are mostly in the hands of the prospectors and, though some have done a considerable amount of test-pitting, the majority of those who have done any work on their claims have confined themselves logically to stripping and putting in pot-shots for samples. Most of these are close to Pelletier Lake.

It is interesting to notice, incidentally, the nnmber of claims upon which visible gold has been found. The original gold vein of the township is that found on an island in Pelletier Lake. On the Davies and Lyman claims on Pelletier Lake and on the Gamble (Spry) and Walker claims south of the lake, visible gold has been found, in addition to encouraging values on assay. A considerable amount of work was done on the Bruce (Agnes Ketchen) claim, east of Pelletier Lake, half way to the Kinojevis River, following the discovery of free gold. Visible gold has been found also on the Rouyn Gold claims on Pelletier Lake — the only claims, by the way, that have had so far the questionable attentions of the mining stock broker. Further afield, free gold has been found on the Bailey claims, two miles northeast of Osisko Lake. Gold has been observed in the Powell vein as well as in the Hammill vein, which may possibly be its extension. Veins on the Horne have the same encouraging symptom, while the Chadbourne hill has it quite obviously. One should mention also the Ruth Cockeram claim, east of the Powell, where good assay values in strong quartz veins have been found, and the Bert MacDonald (Gus O'Donnell) showing northeast of Pelletier Lake, where a good deal of work has been done on a wide and persistent quartz vein.

It is not to be expected that all the above showings will make mines; in fact it is certain already that some of them will not. But it is interesting to find so widespread a distribution of the gold in this section, which will encourage the intensive exploration upon which most of the valuable discoveries inevitably depend.

Lake Fortune

Boischatel township, adjoining Rouyn on the west, is at present the scene of a "rush" of township proportions, due to a tardy recognition of its value as prospecting ground. The most important property so far is the Lake Fortune whose gold-bearing schisted zone has been described at some length in these pages. A 150-foot shaft has been started in this zone and is expected to be finished by the end of the year, when extensive lateral exploration will be pushed ahead. Until this underground work shall have proved up an ore-body of mineable proportions and value, we can only hope that the promise of the phenomenal surface showing will be fulfilled below ground.

The Arntfield Find

It is on account of a property a mile and a half to the east, however, which has no spectacular ore so far

disclosed that the present local excitement has originated. On the Arntfield property, comprising 2,000 acres, there has been found a schisted zone very much like that on the Lake Fortune property. It was located less than three months ago and its examination has been merely commenced. So far the whole of the schisted zone, which is 150 feet or more in width, has shown low values, and a thirty-foot section is workable ore. The schist is impregnated with carbonates and pyrite, is cut by quartz stringers, and in places is silicified. There are two smaller schisted zones parallel to this at a distance of 200 and 600 feet, which also show encouraging values in the few samples taken so far. The strike of these zones is N. 60 deg. W. and their dip 65 deg. to 70 deg. to the north. The enclosing rock is lava. Further surface work is under way, and it is intended to sink a prospect shaft to 150 feet depth and to drive exploration drifts and cross-cuts during the winter.

Summary

To sum up: There are already, as a result of this first season's work, five properties that have sufficient evidence of ore on the surface to warrant underground exploration. The Chadbourne and Lake Fortune shafts are already under way. The Powell shaft will be started soon, and the Arntfield shaft will probably be commenced early in the New Year. Underground work at the Horne is still confined to diamond-drilling.

The striking feature of the season's prospecting work is the fact that, almost without exception, prospecting parties that have applied themselves seriously have found gold, either visible or on assay, and that in several cases these finds promise to be workable ore-bodies. Only a small part of the favourable ground in these two townships has been worked over as yet. It is, therefore, quite possible that when all this ground has received the attention it deserves, there will be a line of gold mines, where now there is only a prospectors' trail, from Lake Opasatika to the Kinojevis River.

Letters From Readers

Canadel and Canadian Gold Mines Corporation

To the Editor,
Canadian Mining Journal

In the issue of the *Canadian Mining Journal* of November 16th, on page 904, under the signature of Alexander Gray, is a statement headed "Canadel - Oh Canadel". Mr. Gray severely criticises the company and the methods of its financing.

In order to set him right I desire to state the following facts: The shares of the Canadel Gold Ltd., to which Mr. Gray refers, are all owned and in the possession of the Canadian Gold Mines Corporation, the Canadel Company being merely an operating company.

The Canadian Gold Mines Corporation has never represented that it owns the Rochester Mine. It has the property under option, has made all the payments to date and has funds on deposit to meet all future payments when they fall due. The company has expended in development in the neighborhood of $250,000, and is a bona fide institution which is developing the Rochester and 52 other mining claims in Porcupine which it owns in fee simple, without regard to the stock markets. The Canadian Gold Mines Corporation has never issued a public prospectus, has never publicly offered its shares, and has never permitted these shares to be quoted on any Stock Exchange here or abroad. The stock has been fully subscribed by substantial people in England and no attempt has ever been made by the present owners to interest the outside public in its shares in either England, the United States or Canada.

Canadian Gold Mines Corporation
25 Broad St., New York by Frank C. Loring
Consulting Engineer.

THE MACKENZIE COAL REPORT

To the Editor,
Canadian Mining Journal

In his letter, appearing in your issue of November 9, Mr. C. M. Campbell seems to have missed the point of my letter, which appeared in the *Journal* of October 19.

I took up the cudgels in defence of the association that the press, daily and technical, had failed to take notice of the late J. D. MacKenzie's memoir on "The Coal Resources of South Vancouver Island," on the ground that the memoir was then — and, so far as I know, still is — unpublished. The mimeographed copy to which Mr. Campbell refers and which I received with Mr. Wyatt Malcolm's letter (referred to in my previous letter) was palpably from its very nature an advance copy for limited circulation. As to whether it was or was not issued to the press, I am as ignorant as Mr. Campbell, but I am inclined to think it was not. Perhaps you, Mr. Editor, will inform us whether you received a copy. My point, therefore, was that the memoir, not being published in the generally accepted sense of the word, could not very well be reviewed.

Mr. Campbell's reference to my letter in your issue of December 22, 1922, in which I made reference to Mr. MacKenzie's re-valuation of the coal resources of Vancouver Island, has no bearing on the point at issue. That reference was obtained from a report in one of the Vancouver dailies (I am not sure which) of the paper read by Mr. MacKenzie at a meeting of the local division of the C.I.M.M. It was Mr. MacKenzie's memoir, not his paper read before the Institute, that I was discussing.

I claim, therefore, that my explanation of the reason why the press were silent about the memoir is correct.

Whether or not there has been an effort to delay or to prevent the Geological Survey from issuing the printed edition of the memoir, I have no knowledge. With the exception of a few minor errors, the mimeographed [illegible] imagine that the printed edition should be ready for distribution before this; but I have no idea what the demand has been upon the Government printing department. I noticed, too, that some little time ago the Government was seeking applications for an editor for its mining publications, and it is possible that shorthanded ness in this department may have caused delay in publishing the memoir.

Victoria, B. C. E. H. Mason

[illegible] not receive a copy of the mimeographed report to which Mr. Mason refers.

The Future of our Mineral Industry

Dr. Corless holds that we must envisage the future greatness of our mineral industry if we are to attain to it.

To The Editor,
Canadian Mining Journal,

I am in hearty accord with Mr. C. M. Campbell's commendable zeal for economy and sanity in the development of Canada's natural resources. I am equally in accord with his desire for conservation of these resources, meaning by the latter term such wise use as will contribute the maximum benefit to the human family. I approve, also, of his criticism of inordinate, foolish or inconsiderate expenditure of money, whether public or private, either for development of these resources or for any other purpose whatsoever. Our financial difficulties have not arisen from lack of natural resources but they have been caused, in some cases at least, by lack of sanity in the time, or the procedure, or the methods selected, in developing them. I have no intimate knowledge of the P.G.E. Ry. in British Columbia. Assuming the correctness of the statements made in regard to it, I would call it sheer insanity to build such a road before investigation of the potential traffic, mineral or other, that would be contributory to the projected line.

Long residence in Northern Ontario and an intimate knowledge of the conditions in the pre-Cambrian, as far as these are at present known, have convinced me that, in spite of the important mining developments of the past twenty years, we have scarcely glimpsed the mineral wealth of this vast area. Nevertheless, no one would oppose more quickly or more strongly than I, the building of a railway at random in this area, on the supposition that it would be certain to tap sufficient deposits to make it a financial success. I can find no statement of mine either before the Institute or elsewhere, that lends any color to the implied inference running through Mr. Campbell's discussions, that belief in the vastness of our mineral resources would cause myself or any other sane man to favor any such method of development. What this belief does justify, what the expression of it in fact, among other things, was intended to encourage, is wisely increased expenditure of money on exploring, geologizing and intelligently prospecting Canada's great hinterlands.

There is a sane and proper order which should be followed in opening up and developing a great mineral area, such as the pre-Cambrian or the Pacific Highland. This order is a matter that has lain outside the province of my discussions so far. If this order, which may differ considerably in different localities, is not followed; if some of its steps are omitted or reversed; the outlay always incidental to mineral discovery and development is inevitably increased. This class of work is costly at its best. It has its own special risks. But that is no reason for timidity. Careful, and usually expensive, investigation along wisely chosen lines is generally necessary in discovering and proving up a valuable mineral deposit. But the man who is unwilling to accept the responsibility of coming to decisions on these matters, or who dwells on the well-recognized difficulties of this class of work and lets them dampen his courage, should choose some other profession than mining engineering. He may be a success at systematically and efficiently extracting ore from a mine but he will soon be without a mine to operate. I should be very sorry, indeed, if the fact, that the topic I chose for discussion before the Institute did not include these perhaps equally important matters, caused any considerable number of my fellow engineers to think that I have no sense of the care required in discovering and opening up our mineral resources. I have at times been called ultra-conservative on this very matter.

But the prime necessity is to establish by sound reasoning that we have these mineral resources, for, because of their hidden nature, no other course is open to us, direct observation being impossible. This is one of the reasons, though not the only one, why, as I have repeatedly pointed out, mining, as an extended business in a new country, is at first slow in coming into its own. Generally, a number of well-exposed mineral deposits are easily stumbled on, usually quite early. These are worked and the conditions of their occurrence are observed. These observations form the basis of induction, perhaps unconsciously, at first. Gradually technical men, and later the public, come to recognize the place of mining as a basic industry of real importance. It is well for us not to lose sight of this later arrival of mining in the natural succession of basic industries. Otherwise the valuable statistics Mr. Campbell has furnished from time to time may be misinterpreted.

So far as one can see, we appear at present to be passing through the transition stage from spasmodic to systematic exploration, development and mining in my own province. To attempt to judge the future of mining in Canada by our past, as Mr. Campbell does, is like attempting to predict the future farming output of the Peace River District by its past production. Very little of our pre-Cambrian territory has even been run over, much less geologized or prospected. Geologizing and thoroughly prospecting our vast mineral heritage will be the work of centuries, not of decades. Forty years has almost certainly not sufficed to find all the ore deposits even in so limited an area as the Sudbury copper-nickel district. Only a few of them have yet been explored, by drilling, to more than 1,200 feet depth. The work of development and mining in a district nearly always reveals fresh clues which, if keenly observed and assiduously followed up, lead to further discoveries not only in the mine itself, but in its locality. The following up of such clues, the introduction of new methods of search, and improvement in technical processes for mining and recovering metals, usually greatly prolong the life of a mining district.

To illustrate: Improved equipment, organization and processes have made mines of the so-called western "porphyries". Sullivan's problem has been solved, to the great credit of the staff at Trail, and this doubtful proposition has become a splendid mine. Even financially mis-handled Rossland is not dead yet. The "Boundary" appears to be an exception. It is hard to believe that even there none of the dozens, or even hun-

dreds, of promising claims will yet come into production or that no further discoveries will be made. Developments at Hollinger, Dome and McIntyre-Porcupine mines revealed geological clues that are greatly extending mining in this camp. So also at Kirkland Lake. The early mines at Cobalt revealed clues that assisted the later ones, and the camp as a whole led the way to Gowganda and South Lorrain. As the Astronomer improves his telescope and other appliances, more stars come into view. As the Mining Engineer increases his knowledge of applied geology and improves his prospecting methods, his technique of mining and ore reduction, and his organization of both brains and energy, more ore reserves are made available.

I have no hesitation in answering Mr. Campbell's categorical question, in your issue of October 19th, affirmatively. I do believe absolutely and literally in the correctness of the statements I made in my Presidential Address regarding the extent of Canada's mineral resources. I believe further that the reasoning employed in reaching the general conclusion regarding the vastness of Canada's potential wealth in minerals is absolutely sound and cannot successfully be attacked. In this belief I know that I do not stand alone. If any considerable number of my fellow members of the C. I. M. M. feel, as Mr. Campbell appears to do, that the position of President was abused during by tenure of office, by the frank statement of my belief in the vastness of Canada's mineral wealth — expressed with as full grounds for the belief as limited time permitted, and prepared with a view of assisting Canadians to grasp more clearly the future relative importance which the mining industry in Canada is certain to assume—, I deeply regret it.

But this will not change my personal view that the mining engineer owes it to his fellow citizens to make these facts known. This, especially in a time of financial crisis such as the present, is only a first step. He owes it equally as a public duty to try to direct public policy sanely toward their development.

This second duty, I believe, Mr. Campbell is trying to discharge. But, in my judgment, the best method of doing this is not along the course he is pursuing. It does not consist in denying that Canada has vast potential wealth in minerals, nor in deploring belief in this as "the worst thing that has ever cursed this country," but rather in the more active policy of seeking to guide our statesmen and others concerned in their development, by sound advice, based on our experience as mining engineers, as to how to discover, develop and recover these minerals with least public and private expenditure and loss. But, if we do not believe that this vast potential wealth exists; if, as Mr. Campbell is doing and as he has stated it to be his determination to continue to do, we denounce this belief at every opportunity; if we regard the determination, skill, hard work and expenditure of money, required to overcome the difficulty of discovering and proving them, as amounting in some way to proof that we have not got them; if, in place of offering advice and encouragement we almost gleefully flaunt our disappointments, which, in prospecting for and proving up ore deposits, will always be many for every real success achieved; then a far larger part than necessary of our mineral wealth must remain undiscovered; and our heavy public debts, due to a great extent to the war and arrested development resulting from it, will press all the more heavily on the shoulders of our remaining industries.

Canadians are now just beginning a new campaign in the effort to open up and settle our great unpeopled areas. The arrest of immigration due to the world struggle appears to be coming to an end. Never has it been of more vital importance that we should, by every possible means, try to grasp the relative extent of our resources. In the case of lands and forests, this is comparatively easy. It is more difficult in the case of minerals. But Canada's great areas from which minerals will be the chief, and in some cases possibly the only, natural resource to be recovered; her climatic limitations; her relatively restricted land areas suitable for cultivation; the advisability of balancing her industries and thus creating home markets for her farm products, now so seriously handicapped by high transportation costs to distant markets—these are some of the factors that make it of supreme importance that our public men should be informed as to the place the mining industry may be expected to occupy in the future development of our country.

As to the quibble Mr. Campbell has tried several times to raise as to whether this or that word is best to use in order to express the ideas I wished to convey, I do not feel justified in taking up your valuable space, and the time of your readers, in a further discussion of this matter. My belief is that my hearers and any subsequent readers, who considered the address without prejudice, generally found no difficulty in discerning the meaning intended; with this I am satisfied. The conviction of the truth of the statements made has been formed in my mind slowly, as a result of nearly twenty years' observation, study and experience and cannot easily be shaken. It was a mature, and not hastily formed, judgment. Moreover, it was a conclusion arrived at in my own special field of work. I accept fully every responsibility involved in expressing it. A short period of exceedingly successful mining development, such as we are now enjoying, or a short period of reverses, would not alter my judgement as to our country's vast mineral resources. If Mr. Campbell has had his attention too closely confined to the "Boundary" of British Columbia or to the coal resources of Vancouver Island, to permit him to study carefully the potential mineral wealth of the remainder of Canada, and, if this experience has affected his judgment, the failure to grasp the greatness of Canada's wealth in minerals is a natural result. But it becomes a very serious matter when he expresses it as his intention to denounce belief in the vastness of our mineral wealth, in view of our known resources in coal, nickel, silver, gold, copper, lead, zinc, asbestos, iron, not to mention gas, oil, clays, building and cement materials and numerous others already discovered in the small fraction of our half-continent that we have barely begun to prospect. This will prove to be not only a fruitless but a thankless task, because it is flying in the face of common sense and reason.

But if he will divert his denunciation to improper, useless or wasteful methods of seeking, developing and recovering this mineral wealth, he will be backed by the judgment of every mining engineer giving serious [illegible]

C. V. CORLESS

Coniston, Ontario.

A Bureau of Steel Manufacturers has been formed in Australia to forward the common interests of iron and steel producers in the Commonwealth.

THE MODERN CHANGE-HOUSE

Data acquired in a survey of change-houses at mines in the Lake Superior iron and copper region are presented in Technical Paper 289, just issued by the United States Bureau of Mines.

When the mining industry was yet in its infancy, the miners changed their clothes at home, leaving the mines after work — dirty, tired, and often in clothes saturated with body excretions, a custom inconvenient and resulting in much ill-health, states Cleve E. Kindall, formerly acting assistant surgeon, U. S. Public Health Service, detailed to the Bureau of Mines for this and similar investigative work. Many miners found it more satisfactory to change their clothes in the boiler rooms. As the industry grew, the mining companies realized that change houses must be provided. These were mere shacks at first, but the modern change house was developed from these unpretentious beginnings. Even now some of the old inconvenient buildings are still in use.

A modern change house at a progressive mine has washing, bathing, and latrine facilities; here employees may change their clothes before and after work. Adequate bathing facilities are especially important at a mine whose ores are soft. Efficient drying equipment should be supplied if there is considerable moisture. Mine foremen and shift bosses at many mines in the Lake Superior region have offices in change houses. One of these offices may be utilized by the timekeeper when checking the men on the various shifts. The posting of safety-first notices and first-aid bulletins on the walls, a common practice in many change houses, is to be commended; in this way they add to many other functions that of agencies for spreading valuable information among the men.

The number of change houses in the Lake Superior region has increased steadily. Approximately 100 companies were operating about 500 copper and iron mines at the time this report was written. The Bureau of Mines investigator examined about 25 per cent of the change houses at these mines, and found many old houses still in use. Since mine operators have discovered that health and efficiency go hand in hand, however, the buildings and equipment have been improved noticeably. This improvement is most marked in the change houses built within the last five years.

A majority of the change houses investigated were of the most modern type, built of brick, stone, or concrete, and roofed with tile or rubberoid. The old buildings were made of wood or corrugated iron. The wooden buildings had roofs of wooden shingles, tar paper, or corrugated iron; and the corrugated iron buildings had roofs of the same material. A structure of concrete blocks or brick, roofed with tile, is recommended. If a material other than tile is used for roofing, it must be noncombustible.

Accessibility to the shaft is an important feature to be considered in the placing of a change house. A few of the change houses noted were built as far as three-fourths of a mile from the shaft, a condition that is dangerous to the health of employees. Men who have been laboring hard underground in a hot, damp atmosphere are very susceptible to colds and pneumonia if exposed to a sudden drop in temperature. This is especially true in the Lake Superior region, where climatic conditions are extreme.

A modern change house that attempts to meet the peculiar needs of the Lake Superior mining industry has been designed by Dr. Kindall and is described in this paper. Practicability, convenience, economy, and sanitation are the ideals that should be incorporated into plans for a modern structure. These ideals were both expanded and modified after an investigation of some of the largest and best plants that manufacture change-house accessories.

ELECTRICAL PROPERTIES OF PERMALLOY THE NEW NICKEL ALLOY

An alloy of nickel and iron has recently been developed which, it is anticipated, will multiply several times the speed of trans-Atlantic cable transmission. In reporting the unique magnetic properties of this metal to the American Physical Society, Dr. H. D. Arnold, director of research of the Western Electric Company, heralded the invention as the greatest development in submarine cable practice since the invention of the siphon recorder by Lord Kelvin.

The new metal, to which the name "Permalloy" has been given, is composed of nickel and iron, the best proportions being about 80 per cent. nickel and 20 per cent. iron. When subjected to a special heat treatment it is distinguished by extraordinarily high magnetic permeability at low magnetizing forces. In some samples that have been tested, permeabilities two hundred times as great as that of the best iron have been obtained. It is the most easily magnetized and demagnetized of all magnetic materials. This gives it remarkable value in such applications as that of the submarine telegraph cable, where large magnetic effects are desired from extremely small electric currents. It is expected also to be valuable in the art of telephony.

A peculiarity of permalloy is its sensitiveness to mechanical forces, the permeability changing greatly when the material is stretched or otherwise strained, without exceeding its elastic limit, and regaining its usual value when the force is removed. If, however, such a force is exerted upon it that the elastic limit of the material has been exceeded, a renewal of the heat treatment is then required to restore its previous permeability characteristic.

No explanation was offered for the alloy's remarkable magnetic property. As determined by X-ray analysis, it has the face-centered cubic arrangement characteristic of nickel crystals, rather than the body-centered arrangement characteristic of iron. Small quantities of chromium or cobalt do not affect it to a great extent but a minute quantity of carbon adversely affects its magnetic permeability.

Thus there is added another to the already extensive list of nickel alloys used for electrical purposes.—from *Inco*.

THE QUEENSLAND SILVER-LEAD FIND

Further reports from reliable sources have now been printed regarding the new and important silver-lead find in Queensland, Australia. It is 26 miles due north of Chillagoe, but the road to it is 47 miles long. The outcrop is approximately three-quarters of a mile in length and ten samples taken from sections 100 feet apart have averaged from 52 oz. to 70 oz. of silver and 50% lead. Values throughout the lode as at present determined are of markedly regular distribution. It is hoped this find will lead to a revival of mining in North Queensland.

Ontario's Metalliferous Production -- First Nine Months, 1923

Prepared by W. R. ROGERS, Statistician

Returns received by the Ontario Department of Mines from the metalliferous mines, smelters and refining works of the Province for the nine months ending Sept. 30th, 1923, are tabulated below, and for purposes of comparison the quantities and values are given for the corresponding period in 1922. Tons throughout are short tons of 2,000 lbs.

Product	Quantity		Value $	
	1922	1923	1922	1923
Gold, ounces	749,631	705,183	15,506,896	14,577,315
Silver, ounces	7,560,301	8,604,543	5,609,625	5,632,560
Platinum metals, ounces	113	950	7,771	92,430
Nickel (metallic), tons	3,491	8,337	2,012,539	3,268,871
Nickel in matte exported (*)	2,927	6,962	1,595,500	2,784,800
Nickel oxide, tons	235	4,275	81,160	1,224,091
Nickel sulphate, lbs.	27,270	.....	2,231	.....
Cobalt (metallic), lbs.	22,173	210,176	60,932	531,699
Cobalt oxide, lbs.	293,364	327,912	589,883	638,969
Unseparated Cobalt-Nickel oxides and residues, lbs.	1,002,936	481,049	218,556	182,305
Lead, pig, lbs	2,593,888	3,291,518	147,698	214,644
Copper sulphate, lbs.	22,553	.....	1,310	.....
Copper (metallic), tons	1,052	5,055	245,489	1,523,412
Copper in matte exported (*), tons	3,191	4,368	526,860	873,600
Iron ore (**), tons	4,304	7,594	25,261	26,452
Iron, pig (***), tons	12,296	9,543	291,926	231,496
Total	.....	.....	26,923,637	31,802,644

* Copper in matte valued at 9 and 10 cents per pound and nickel in matte at 25 and 20 cents per pound in 1922 and 1923 respectively.

** Figures in the table cover shipments to points other than Ontario blast furnaces.

*** Total output of pig iron from both domestic and imported ore was 550,355 tons worth $13,350,398. Figures in the table represent proportional product from Ontario ore.

General Remarks

The total value of metalliferous production for the nine months under review exceeded that during the corresponding period in 1922 by $4,879,007 or 18 per cent., thus demonstrating the strong position which Ontario's metal mining industry occupies at the present time. Gold production shows a small decline due to power shortage during the first quarter of the year. This is explained under the heading "Gold". However, if production for the last quarter of the year equals that for the third quarter, the full year 1923 will show an output of over $21,000,000 as compared with $20,374,109 in 1922.

The total output of silver shows an increase of over one million ounces. A revival of interest in this metal has resulted from the mining of rich ore in South Lorrain.

The nickel-copper industry is back again on a pre-war basis of output, with the difference that the main outlet for products has switched from armament purposes to industrial uses. Details regarding the several metals are given under separate headings.

Gold

Ontario's production for the third quarter of the year was at the rate of 95,566 ounces per month. Power shortage, as already stated, seriously interfered with production early in the year. This condition was remedied by the addition of two new hydro-electric plants on the Mattagami and Montreal rivers. These are now supplying power to Porcupine and two other large power plants are under construction on the Abitibi and Quinze rivers to meet present and future requirements of northern Ontario's mining industry.

Night Hawk Peninsular is scheduled to begin milling operations with a 150-ton plant before the end of November and the Vipond Consolidated (150 tons) is expected to start milling before the end of the year. On several other promising properties in the Porcupines and Kirkland areas development is under way.

The Argonaut mine in Gauthier township commenced milling operations in July. The ultimate milling capacity is 200 tons. Croesus in Munro township is being operated again. It is equipped with a 15-ton amalgamation mill to treat the rich ore found on the property. On the Crown Reserve and Associated Goldfields properties at Larder Lake, large ore bodies are being blocked out. Development is proceeding at Matachewan, West Shining Tree, Lightning River, Schreiber, Boston Creek, Painkiller Lake and other promising areas. That the pre-Cambrian gold areas of northern Ontario are rich both in performance and possibilities is evidenced by the widespread attention they are attracting both in America and abroad.

Details of production for the period under review are given in the table on the following page.

In addition to the value of gold noted in this table, Ontario producers received for their contribution to the Dominion Smelting Bonus [illegible]

Crude gold bullion received at the Royal Mint, Ottawa, from Ontario mines [illegible] and amounted [illegible] fine ounces of silver.

Nickel and Copper

[illegible] producing therefrom 41,996 tons of nickel-copper matte. Exports of matte to Clydach in Wales and Huntington, W. Virginia, totalled [illegible] were further treated in the refineries [illegible]

Source	Ore Milled tons	Gold Output ounces	Gold Output value $	Silver Output ounces	Silver Output value $
Porcupine					
Dome Mines	282,800	155,447	3,213,789	23,308	[illegible]
Hollinger Consolidated	974,031	349,609	7,227,071	58,718	[illegible]
McIntyre Porcupine	204,373	99,364	2,054,039	17,539	[illegible]
Clifton Porcupine	1,275	253	5,241	[illegible]	32
P. Clyne	.....	6	117	1	[illegible]
Jas. Huddlestone	.....	117	2,414	12	[illegible]
Total	1,462,479	604,796	12,502,671	99,628	[illegible]
Kirkland Lake					
Kirkland Lake	36,373	9,048	187,046	[illegible]	[illegible]
Lake Shore	16,500	19,118	395,214	1,376	[illegible]
Teck-Hughes	38,321	40,275	832,548	2,865	[illegible]
Wright-Hargreaves	58,229	28,542	589,877	3,579	[illegible]
Kirkland Lake Proprietary	1,803	580	11,984	[illegible]	[illegible]
Total	151,226	[illegible]	2,016,669	9,360	[illegible]
Miscellaneous					
Contact Bay	.....	43	[illegible]	[illegible]	[illegible]
Grace Mines	.....	7	151	3	[illegible]
Argonaut	5,452	1,622	33,526	[illegible]	[illegible]
Creosus	338	563	[illegible]	44	[illegible]
Nickel-Copper refining	.....	589	11,775		
Total	5,790	2,824	[illegible]	231	[illegible]
Grand Total	1,619,495	705,183	14,577,315	109,219	[illegible]

of the two first-mentioned companies, located respectively at Deschenes, near Ottawa, and at Port Colborne on Lake Erie. From matte refined in Canada with the exception of a small recovery by Ontario silver refineries, copper, nickel and nickel oxides as noted in the table were produced. In addition 589 ounces of gold and 37,386 ounces of silver were recovered, also metals of the platinum group including 371 ounces of platinum, 499 of palladium and 80 of rhodium and iridium.

The nickel and copper contents of matte exported have been given an arbitrary valuation in the table of 20 cents and 10 cents per pound respectively. The average New York price of electrolytic copper for the period was 14.99 cents per pound, while average electrolytic nickel prices as given by the producers vary from 23¼ to 28 cents per pound.

Silver

It is gratifying to report a marked increase in silver output. Cobalt began production in 1904 and reached its zenith in 1911 when 31,039,104 ounces were shipped from Cobalt and outlying silver areas. Now the South Lorrain camp, some eighteen miles to the southeast, has revived and is attracting attention owing to the excellent results obtained at the Keeley and Mining Corporation of Canada mines. These properties shipped 2,286,290 ounces of silver during the period, in addition to high grade cobalt ore and residues. Silver operators were paid for 583,246 pounds of cobalt contained in shipments.

The principal silver shippers were: Nipissing, 2,525,913 ounces; Mining Corporation, 1,701,532; Keeley, 1,135,179; O'Brien, 661,934; Coniagas, 618,093.

At the Colonial mine, which adjoins the O'Brien to the southeast, a shaft has been sunk 1,000 feet and good silver values obtained near the lower contact of the diabase sill. High grade shipments are now being made. A new concentrating mill on the Castle Trethewey mine at Gowganda is nearing completion.

Shipments of ore, concentrates and residues over the T. & N. O. railway were 78 cars or 2,866 tons to Deloro in southern Ontario, and 27 cars or 1,086 tons to the United States, principally to Perth Amboy, N.J.

Refineries: The Coniagas Reduction Company of Thorold and the Deloro Smelting and Refining Company treated 1,893 tons of ore and concentrates and 4,479 tons of residues for the recovery of silver, arsenic, copper, cobalt, nickel and compounds of the two last-mentioned metals. Sales of metallic nickel were 34,055 pounds worth $8,590, and of nickel oxide 38,964 pounds valued at $5,044. White arsenic marketed was 1,752 tons worth $395,638. The quantities and valuation of cobalt and compounds, also of unseparated cobalt-nickel oxides and residues marketed, are noted in the table.

Iron Ore and Pig Iron

The only shipper of iron ore was Moose Mountain Limited. Of a total of 24,062 tons of beneficiated magnetite shipped, 16,168 tons went to the Hamilton blast furnace, and its value is included in the output of pig iron.

Blast furnaces at Sault Ste. Marie, Port Colborne and Hamilton, operated 7 stacks for an average of 201 days each. The total ore charged to furnaces was 1,002,089 tons, of which only 17,383 tons or 1.734 per cent. was of Ontario origin. Pig iron output is noted in the table. Steel production was 514,694 tons worth $17,571,268.

Lead

Except for a small recovery from silver ores, the entire shipments of lead, as given in the table, were made by the Kingdon Mining, Smelting and Manufacturing Company with mine and smelter at Galetta on the Ottawa River.

VIKING GAS WELLS SUPPLY EDMONTON

Natural gas is now being delivered in Edmonton from the Viking field, where ten wells are in operation with a daily open flow of 40,000,000 cubic feet. Seventy-seven miles of main line were constructed between Edmonton and Viking and 81 miles within the city. The total cost of the undertaking was about $3,000,000.

INCREASING USES OF SILVER

In these days of scientific salesmanship it is rather unusual that any article of accepted merit shall not increase its sales in proportion to the general increase in business. Intense advertising campaigns and high-grade salesmanship develop greater demands on the part of the public for various kinds of merchandise.

The use of articles formerly classed as luxuries, but which through increased ability to buy have become necessities in almost every line have increased enormously.

It is a startling fact to know that notwithstanding the enormous increase of consumption in almost every other line that the use of silver for manufactures and the arts has practically remained stationary. Were it not for the increased use of silver in photography, in particular relation to the moving picture business, the records would show a very marked decrease in the amount of silver used for industrial manufacturing purposes and in the arts. Iu 1911, 32,013,685 ounces of silver were used in manufactures and the arts.

During the 12 years , 1911 to 1922 inclusive, the average use of silver in manufactures and the arts was 31,922,514 ounces.

Contrast this situation with the total annual volume of business in the United States. For purposes of general comparison it would doubtless be safe to say that this volume of business since 1911 has at least doubled. In this increased volume of business the consumption of other metals and minerals has increased more rapidly than other products. Silver alone of the metals used in industry and the arts has lagged behind.

In no other comparable line of production has consumption been at a practical standstill, and perhaps in no other line has there been so little effort to increase sales by stimulation of public interest, by advertising and through the higher arts of salesmanship. The difficulty has been that silver has been bought and not sold. Silver producers have been unorganized; there has been no concerted effort to show the public the advantages of the use of silver. Substitutes for sterling tableware have taken the place of sterling. Silver tableware manufacturers have changed their patterns so frequently as to make out of date the family silverplate to which additions would be constantly made if mentioned patterns were available.

If the plans proposed by the committee of silver producers growing out of the Reno conference are carried out there is litle doubt but that there will be a very large increase not only in the demand for sterling silverplate, but in other lines silver is used in the arts and industries.—The Mining Congress Journal.

TRANSVAAL PLATINUM DISCOVERY

In the September issue of the *Journal* of the Chemical Metallurgical and Mining Society of South Africa, there is printed a paper by M. Bauman describing a unique occurrence of platinum in the Waterburg district of the Transvaal, which may be of considerable economic importance. Mr. Bauman first describes the ordinary occurrences of platinum in placers, in certain ultra-basic rocks such as serpentine, in ores of nickel and chromium, as at Sudbury, Ontario, and in the Rand banket. Describing the new deposits, he says:

"From the foregoing, therefore, it is evident that the recent discovery in the Transvaal of platinum in a quartz lode in acid country rock extending over a considerable distance is something quite new and quite unique. The lode in question is a brecciated quartz filling in a fault or fracture plane in the felsite of the Bushveld complex. Its location is in the Waterberg District about 24 miles north of the town of Nylstroom and about 100 to 110 miles north of Pretoria. The lode has been traced from a point on the farm 'Rietfontein' 1638, about 10 miles to the west of Naboomspruit Station, in a west to north-westerly direction for a distance of about 20 miles on to the farm 'Doornkom.' The lode matter consists of a brecciated quartz filling with angular inclusions of felsite, Specular iron ore and a highly ferruginous silicate are accessory minerals together with a small amount of chromite. There is much secondary quartz. The unbroken outcrop resembles hundreds of other quartz outcrops in this country. The rock is harder than the felsite, and where not covered by overburden the outcrop stands out prominently above the surrounding country. Freshly broken ore shows a laminated arrangement of alternating bands of white and red or pink, or appears as an agglomerate with sharp red fragments of felsite in a groundmass of white quartz. Up to the present no type of lode matter in particular has been found to carry plantinoid values. Good values have been obtained in the laminated and in the agglomerate variety, and even in pure white honeycombed quartz. The lode itself varies in width from a foot up to 30 feet. In many places the lode exists as two or three separate bodies with intervening felsite. The general dip of the country rock is flat and to the north; the lode itself, however, dips very nearly vertically and probably south.

"Active prospecting in two areas showed platinum in the outcrop. On the farm 'Doornhoek' the lode was found to be very wide (30 ft.), but the values so far have been very low. At 'Rietfontein,' however, where the lode can be traced continuously for 3,000 yards, the outcrop has been trenched and party stripped for a distance of about 400 yards along the strike, and though, of course, many samples were taken which gave little more than a trace, good but erratic results were obtained over this area. It should be remembered that owing to the fact that prospecting has only recently started here, the identification of what might be called the value-carrying horizon in a lode which is very wide in some places and split into two or three bodies in others, is very difficult, and that from the nature of things many samples have been taken where *ab initio* the presence of platinum was unlikely. The following list of some of the better results over this length of 400 yards is interesting:—

Platinoids.			Width
11.0	dwts.	over	20in.
111.5			1st
8.0	"	"	18in.
32.5			4th
51.0			4th
8.6	"	"	12in.
48.3	"	"	9in.
89.5	"	"	9in.

"The last two results came from one exposure of 54 in. width, in which the lode, about a foot below outcrop, was sampled in six sections of nine inches each. The average of the first two sections is therefore 68.9 dwt. over 18in. or taking the other four sections into account (all of low value) 23.3 dwts. over 54in. Even in a gold mine a section giving 1,258 inch dwts. would be considered more than good. The platinum in the ore is generally very fine, though quite coarse, nuggety pieces are sometimes met. The work so far done is in all [illegible] stage of development that not sufficient data have been collected to throw out any hypothesis as to the formation of the lode and the genesis of its metallic content."

CONTINUED EXPERIMENTS ON COPPER LEACHING METHODS

The leaching of complex copper ores continues to constitute the major problem of the Southwest experiment station of the United States Bureau of Mines, at Tucson, Arizona. The work is centered on the development of methods for the oxidation of ferrous sulphate by air containing sulphur dioxide gas, for the manufacture of ferric sulphate and sulphuric acid in the leaching solution. Two methods of application have been worked out: (1) The direct manufacture and simultaneous leaching as brought out in the special drum apparatus developed by the Bureau of Mines (2) the prelminary manufacture of ferric sulphate and sulphuric acid with its subsequent use as a solvent for copper minerals.

In the drum or direct method, the ferrous sulphate is introduced in the pulp entering the drum, at no cost, through the re-use of the solutions when the dissolved copper has been precipitated by iron. The solution entering the drum need contain only 0.3 to 0.5 per cent iron as ferrous sulphate. By control of the percentage of sulphur dioxide in gas entering the drum countercurrent to pulp flow, the percentages of ferric sulphate or sulphuric acid are regulated. With low gas, under 0.5 per cent sulphur dioxide, the process makes for maximum percentage of ferric sulphate, a desirable condition when sulphide minerals are to be leached. A high percentage of sulphur dioxide gas (3 per cent plus) produces a maximum of sulphuric acid, a condition desirable for leaching of the silicate forms of copper. This method should find favor in the leaching of complex ores and tailings when the sulphide value does not warrant an additional flotation operation.

The manufacture of ferric sulphate or sulphuric acid may be effected in three ways: (1) By introducing air containing sulphur dioxide through a porous medium into water or pulp containing the ferrous sulphate to effect a fine division of the air passing into the solution or pulp. The air containing sulphur dioxide may be bubbled through the solution, being admitted by an air jet producing more or less violent agitation of the solution and bubbling of the gas. (2) The air containing sulphur dioxide may be beaten into the solution of pulp by means of mechanical agitators, such as are used in flotation operation. (1) Air may be used, as in methods 1 and 2, and the sulphur dioxide introduced into the solution or pulp in the form of sulphurous acid—that is, a solution containing sulphur dioxide.

Ferric sulphate readily dissolves one-half the copper in the mineral chalcocite and gradually attacks the balance. Action increases as the temperature of solution rises. This method is applicable to dump leaching or vat leaching, and should find favor where the copper is leached in fairly coarse ore.

The manufacture of sponge iron is closely allied with this method of leaching copper, because large-scale operations demand a known source of iron supply. Sponge iron is a favorable form of iron for this work. The rotary furnace developed by the Northwest Experiment Station of the Bureau of Mines is giving satisfactory results for making sponge iron for mill work at Silver City, Utah.

The separation of clear solution from ore pulp by counter-current decantation or filtration finds favor with several operators and probably will win out when the copper content of solution is high.

The precipitation of copper in the pulp and subsequent recovery by flotation is a simple operation, requiring but low installation cost. Its adoption is dependent on high flotation recovery. Results indicate 90 per cent recovery of precipitated copper can be obtained by flotation after preliminary tests necessary to adjust flotation conditions for each individual ore.

MELTING OF SPONGE IRON

Experimental work on the production of foundry iron from sponge iron in the electric furnace, performed by the Seattle station of the United States Bureau of Mines, demonstrated that technically, at least, the process is a success, though large-scale tests are necessary to determine its commercial applicability. Such a process would find application in melting iron in regions remote from blast furnaces, or where establishment of blast furnaces would be impracticable. Sponge iron was melted in batch runs and continuous runs in various types of furnaces, and under both acid and basic conditions.

The type of furnace found best fitted for the continuous melting of sponge iron is a deep pit furnace with a single electrode and a conducting hearth. The main problems solved were: High recovery of iron, clean separation of the slag, obtaining metal of a high-carbon content, introduction to the metal of silicon and manganese from the slag to eliminate the necessity of using ferro-alloys, and, finally, the removal of sulphur. In order to produce the best quality of gray iron, an auxiliary furnace would be necessary to adjust the final composition of the metal.

REDUCTION AND CARBURIZATION IN IRON SMELTING

Observations made in experimental work on sponge iron and synthetic cast iron, performed at the Seattle station of the United States Bureau of Mines, led to certain conclusions regarding reduction and carburization that differ in some respects from prevalent belief. These findings are being further studied. As a result of this work it would seem that it may be possible to produce low-carbon iron from the blast furnace. In order to obtain exact data on the combination of carbon with iron, reduction tests are being carried on with molten iron in contact with solid carbon and with gases. In the course of this work, it was found that gases (methane, acetylene, or carbon monoxide) were valueless for introducing carbon into molten iron, but solid carbon dissolved rapidly.

SASKATCHEWAN'S SODIUM SULPHATE

Progress and bright prospects in the development of sodium sulphate in Saskatchewan, are reported by the provincial Bureau of Labor and Industries. Sodium sulphate recovered from Saskatchewan deposits is now being used in the manufacture of glass at Redcliff and six deposits so far have been investigated by the Federal Department of Mines. Other known deposits not yet investigated by the department number close to ninety.

METAL MARKETS

(Prices in carload lots, f. o. b. Montreal, as quoted by Consolidated M. & S. Co.)

Average for week ending December 4

Electrolytic copper	13.00
Zinc	7.05
Lead	7.87½

THE MINING DISTRICTS

By THE JOURNAL'S CORRESPONDENTS

NORTHERN ONTARIO

Mines a Mathematical Certainty!—A new exploration mpany is being formed in Toronto, known as the nada Gold Syndicate. The scheme is quite an am- ious one, and while some of the high-pressure stock- ling methods are being used, the proposal appears have the merit of sincerity. Prospective purchasers shares receive an engraved invitation to become nders in the syndicate and are assured that the in- ation are being sent only to a select few whose stand- has been investigated, and that the invitations are orded and are not transferable. This is the usual ome-on" stuff, as it turns out that there has been vide distribution of these so called invitations, and some cases a house to house canvass. The capital is 00,000 shares, of which 900,000 are to be treasury res and 100,000 founder shares, the latter being en as a bonus with the preorganization offerings l presumably also to the promoters. The treasury res are to be sold only for cash, the preorganization ering being at $2.00 a share. This offering was to se November 22nd and the next offering is to be de at $2.50 a share. The promoters hope to realize average of $4.00 a share for the 900,000 shares, which mbitious, to say the least. The syndicate claims to e options or contract covering the purchase of nine ups of properties, but says nothing about the price or igations, and places on these contracts what appears e a greatly inflated value to the Syndicate. Neither nything said about who is to pay for the engraved itations, expensive booklets and long distance tele- ne selling expense. The promoters assure them- es and prospective purchasers of shares that success l be a matter of mathematical certainty by taking antage of the law of averages, and that out of 500 perties submitted to them they will acquire three or r mines from which they estimate minimum annual fits, applicable for dividends, of $1,750.000. Un- tunately the finding and development of mines is such a simple matter as the Syndicate organizers m to think, and what appear to be mathematically tainties often go wrong. Altogther the literature the Syndicate appears to be extremely vague on im- tant point and gives the impression merely of high- ssure stock-selling methods. On the other hand, promoters appear to be sincere and there is no stion that properly conducted exploration syn- ates are a benefit to the mining industry.

nconvenient Road Building Methods—Roads to es and mining centres in Northern Ontario are of greatest importance to the operator. To build m the assistance of the Government must be obtain- and while the Government has shown a very com- ndable enterprise in this connection, their methods open to a good deal of criticism. A case in point is road to South Lorrain, which was very badly ded to provide adequate transportation to an im- tant and growing camp. It was, of course, of partic- r importance in the early development of the dis- t, when the great part of the materials for plants and construction ha dto be transported. The operators would have been well satisfied if the road extension to the camp had been built and the present road gravelled. The Government, however, appears to have certain standards which must be enforced, irrespective of immediate requirements, and the road had to be ditched and widened before any metal was put on. There also seems to be a well established delusion among Government road builders in this section that the best material to put in the centre of a road is the sod from the ditches, and as a consequence when the rainy season came this acquired the consistency of a thin jelly. The result has been that this fall, after the Government had been working for the second year on the road, the mines had to transport part of their supplies to South Lorrain by boat. Probably by this time next year there will be a good road, but in the meantime the operators have been put to great trouble and expense on account of poor transportation. On account of the money the government is expending the operators do not feel that they can complain, although they would have been satisfied with a smaller expenditure, which would have provided for their immediate requirements.

Stating Regulation for Gillies Limit—The Department of Mines has handed down a ruling in connection with taking in the Gillies Limit which provides that stakers of claims shall be entitled only to that portion of a block for which they apply. Previous to this some surveyors were under the impression that claim boundaries should be the same as in the unsurveyed territories, where prospectors' stakes govern, while other surveyors were of the opinion that the claims should form an aliquot part of a block. Fortunately this matter has been handled promptly by the Government, which will prevent any further misunderstandings. It was due to this uncertain situation that the dispute arose over the ownership of the big silver nugget recently found in the Gillies Limit.

Mr Marriott in Cobalt—Mr. Hugh F. Marriott, Past President of the Institute of Mining and Metallurgy, London, and one of the most prominent Mining Engineers in Great Britain, has been visiting the mining centres of Canada on his return from the Scientific Congress recently held in Australia, where he was the representative of the British Government. On this trip Mr. Marriott has visited several British Dominions and Colonies, where he has been advocating the forming of an Empire Council of the mining industry and an Empire Federation of Mining Engineers. The proposal originated in the Institution of Mining and Metallurgy, and Mr. Marriott is their official spokesman. It is proposed that representatives from the mining societies of the different countries should meet in London next June at the same time as the Empire exhibition is being held in order that the Council may be properly organized. If the proposal meets with approval, as now seems probable, representatives would be elected from the different countries to the Central Council, which would be so constituted that each country would have the same number of representatives, irrespective of the number of engineers

each contained. Such an organization would provide for the free interchange of ideas and would deal with Empire problems in the mining and metallurgical industries. Its chief aim would be to raise the status of the industry and of the engineers. To bring this about it is proposed to establish a register of mining engineers and metallurgists within the Empire. Qualifications for registration would, in all probability, be similar to those at present in force in the Institution of Mining and Metallurgy, which are probably the strictest of any similar organization. Membership would be divided into three classes, members, associate members and students, with provision for revision at regular intervals. This registration would be published in book form and would be given as wide a distribution as possible in order that those who wanted to employ a mining engineer in any part of the Empire would have no difficulty in finding a man with suitable qualifications. The possibilities of such a proposal are very far reaching and deserve the most serious consideration. From the reception Mr. Marriott has had in the countries and mining centres he has visited, there seems to be little doubt that the proposal will go through.

Porcupine—A number of Dome directors recently visited the property and express themselves as being highly satisfied with the progress being made. Underground developments are exceedingly favorable and the mine has more ore in sight than at any time in its history. The lower levels in particular are exceeding expectations and large bodies are being developed on the 12th level, regarding which there were so many rumors a few months ago. In October the net profits were $230,000, which is greatly in excess of dividend requirements. The directors state that the Dome Extension will turn out to be particularly valuable, although the amount of development work done to date is comparatively limited. This is on account of the fact that so much work has been necessary on the Dome that there has not yet been time to develop properly the Dome Extension. The directors also disposed of recent rumors to the effect that they were interested in adjoining claims and denied that they had any intention of taking up any more ground near them.

At the West Dome Lake a station has been cut at 750 feet, and sinking is again under way. Two more levels will be established, one at 900 feet and the other at 1,050 feet. Officials of the company appear to be satisfied with developments and state that there is no question but that the West Dome is now a mine.

The Vipond mill is being tuned up preparatory to continuous operations, which it is expected will begin in about two weeks. The mill has been put in first-class shape and the capacity increased to 150 tons a day. Mill heads are estimated to run $10. a ton, and, with prospects of sufficient power for the winter, a good profit should be realized.

The McIntyre has declared its 21st dividend, amounting to 5%, payable January 2nd to shareholders of record December 1st. The dividend is at the rate of 15% a year.

Sufficient Power during Winter Months—Officials of the Northern Canada Power Company state that the possibilities of a power shortage this winter have been practically eliminated. The storage basins are all full and water is running to waste at present. The Sturgeon Falls plant, which provides several thousand additional h.p., is in full commission, though there has been n corresponding increase in power demands. It is n anticipated that the demand during the winter wil show any material increase, and the company shoul be able to get through the winter without any dif ficulty. The Quinze power project is ahead of sched and unless altogether unforeseen difficulties arise, th company should be in a position to deliver power fro that source in Porcupine next summer.

South Lorrain—Shaft sinking has again been starte at the Lorrain Trout Lake property, which is under th management of the Mining Corporation. The shaft i down 280 feet, and will be continued to the contact which lies approximately 200 feet deeper. The botton of the present shaft is about 200 feet higher, geologic ally, than the famous 7th level of the Keeley, and th Trout Lake anticipate better results as depth is at tained, although the results to date have been ex ceptionally satisfactory. The Mining Corporation ex pects to cut the Woods vein on the 5th and 6th level some time in December. This development will be o great importance to the company, as the 66th level i at a depth of 550 feet and is above the geologic horizon of the 7th level of the Keeley.

Cobalt—The [illegible] has [illegible] ahead 13 feet fro its recent discovery, and in addition has developed considerable tonnage of mill rock. The ore-shoot h been developed for a length of 60 feet, and show every indication of further extensions.

In the Southeast part of Coleman township, th Victory has decided to continue its shaft, and is askin for tenders to sink an additional 100 feet below th 450 foot level, at which depth it is expected the vein will be met.

The Coniagas expects to cut the vein for which it h been driving on the 1,200-foot level of the Beaver with the next two or three weeks. A successful issue to th development will be of considerable importance, n only to the Beaver and the Coniagas, but to the cam as a whole.

During the week ending November 16th, shipmen from Cobalt amounted of ten cars sent out by t Coniagas containing 114,780 pounds of ore, and one c by the O'Brien, containing 64,360 pounds.

Kirkland—Steady progress is being made on t branch railway into the Kirkland district, and it expected that trains will be run into Larder next su mer. This is much behind the preliminary estimat as construction has been delayed by bad weather and shortage of labor.

West Shining Tree—It is understood that the To pah Mining Company of Nevada will not take up option on the Westree property, in Shining Tree. Le difficulties have also occurred in connection with t organization on the Murray Magrigg land in t meantime, the company is unable to proceed furt with work on that property.

CALGARY REFINERY IN OPERATION

The Imperial Oil Company Limited has started firing at its Calgary plant, which has just b finished. In place of the 2,500 barrels daily outp which was originally planned the production is 4,0 barrels. About 250 skilled workmen are being gi permanent employment in the $2,500,000 refinery. crude oil is being brought from the Montana field across the border from Alberta.

BRITISH COLUMBIA

Soda Ash Plant in Operation.—Developments have occurred this year in connection with deposits of soda near Chasm on the Pacific Great Eastern Railway, owned by the Lilloet Soda Co., which merit notice. A new industry, states A. W. Davis, district mining engineer, may be in the making. A small plant for the production of soda ash was installed recently which has turned out very successfully. Raw soda has been shipped intermittently from this point for the manufacture of soap but for no other purpose. The large amounts of salts of various compositions occurring in the dry belt of the great central plateau of British Columbia present great possibilities and the installation of chemical plants, such as the one noted, is of special interest.

Cariboo Property in Litigation.—Extensive property holdings in the Cariboo District, standing in the name of the Lightning Creek Gold Gravels and Drainage Co. Ltd. are an issue in litigation before the Provincial Courts on the 21st November last. Application was made on behalf of the Company named and Charles H. Tnverzagt, New York, for an order compelling Joseph Carpenter Jr., of Wilmington, Delaware, to increase the amount of security advanced by him for the payment of defendants' costs in the event of his suit failing. Accordingly Carpenter is to be asked to add $1,000 to the $300 already put up for this purpose. Carpenter alleges mis-management of the Wingdam placer mining project. He seeks an accounting of receipts and moneys expended as well as damages against Tnverzagt. An order was made providing for the examination of Carpenter on discovery at Delaware.

Rossland Mines Shipping.—Rossland Mines now are reported to be making daily shipments to the Trail smelter, Consolidated Mining and Smelting Co. Properties that have been non-producers for years again are yielding ore. Consequently there are more men employed in the historic mining camp, business has materially improved, and the outlook is bright.

Silver Find Reported at Alice Arm. Specimens of high-grade silver ore have been taken from the Toric group of mineral claims, adjoining the Dolly Varden mine, in the Kitsault Valley section of Alice Arm district. Some of the samples have given returns on assay that, to say the least, are encouraging. Three veins are under development. One, it is said, starting a foot wide at the outcrop, widened to five feet when in a distance of about thirty feet. On the surface it can be traced for 400 feet. There has been considerable open cutting and stripping with satisfactory results. The ore is galena and argentite flaked with native silver. The owners are hopeful of having found the making of another Dolly Varden mine. The work of exploration and development will continue next season.

Tungsten Ore Reported near Prince George. A body of tungsten ore is reported to have been located on the property of the Granite Mining Company, Eaglet Mountain, near Prince George, northeastern British Columbia. An 800-foot tunnel is said to have tapped three veins of the mineral and a trial shipment is to be made to the Trail smelter.

Opposes Guarantee; Advocates Bounty.—The Board of Trade of Trail has gone on record as being opposed to the Provincial Government guaranteeing the bonds of a private corporation in connection with the initiation of an iron and steel industry. The Board, however, approves of the granting of a bounty on actual production.

Trail Ore Receipts. — Ore receipts at the Trail Smelter, Consolidated Mining & Smelting Co., for the week November 8 to 14 inclusive, totalled 8,972 tons, made up as follows:

	Tons
Alamo, Alamo	51
Company Mines	8,112
Emerald, Salmo	50
Knob Hill, Republic Wn.	137
Lone Pine, Republic Wn.	238
Quilp, Republic Wn.	71
Ruth, Sandon	36
Silversmith, Sandon	182
Van Roi, Silverton	95
	8,972

Usk.—The Federal Mining Co., is reported to have taken over a promising prospect on Gold Creek, near Usk on the Canadian National Railway. The construction of a road from Usk to the property and development on the claims is proposed when weather permits.

Encouragement for the Prospector. Dr. A. McKenzie Meldrum, Chancellor of Spokane University, addressing a Board of Trade meeting at Vancouver recently, pleaded for more encouragement and support for the prospector. Intelligent mining investment had made much more money than had ever been made in real estate. The indifference of citizens of the country toward mineral resources, and the lack of encouragement afforded prospectors and mining development in all its stages, were deplored. Most of the large business blocks in Spokane were the result of the earnings of mining enterprise. It was suggested that this was not true to any extent of Vancouver. It was a pity to see the prospector becoming an extinct species. The greatest of the world's mines had short lives as time goes. New properties must be discovered and there was no better prospecting ground in the world than British Columbia.

Immigrants Lack Employment.- Some forty or fifty men reached Nanaimo during the third week in November, having come from Great Britain, according to their account, as a result of glowing accounts of Western Canada and its possibilities as a [illegible]. Many of them are coal miners and so they headed for the chief coal mining centre of British Columbia. Unable to obtain work immediately, they sought the assistance of the Provincial Government. The representations [illegible] and their present condition are being made the subject of investigation.

A Municipal Venture. The city of Vancouver has decided to go into the coal business. The city pays $9.20 [illegible] and it is figured that this coal can be delivered at the [illegible] at $9.25 a short ton. This is a substantial reduction as compared to the retail prices of graded and screened as sold by the retail dealers. It is pointed out, however, that [illegible] can be supplied by [illegible] cannot be delivered.

ALBERTA

The British Petroleums Oil Well.—Oil has been struck by the British Petroleums Ltd., at a point in northern Alberta nine miles north of the town of Wainwright and in close proximity to Edmonton, the capital of the Province. Accounts of the occurrence indicate that, after the drill passed through an 18-foot sand stratum at a depth of something over 2,000 feet on Saturday, November 10th, baling showed distinct indications of oil. Baling was continued for three days and, on the following Tuesday, the flow was established. At noon on that day there were 1,535 feet of oil in the casing and at 3 p.m. on the same day it had increased to 1,750 feet. In the well is an 8¼ inch casing and running from it is a flow line of smaller dimensions. On the night of Tuesday the oil gushed from the flow line as high as the derrick and all valves were closed immediately. Drilling started last June but there were some delays, there having been six weeks of actual drilling with a 10-hour shift daily. The work was done by the Edmonton Gas & Development Co., under the supervision of E. H. Campbell, field manager, with D. O. Credille as head driller.

The headquarters of the British Petroleums Ltd. are at Vancouver. Newton W. Emmans, geologist and petroleum engineer, on returning from an inspection of the Fabyan-Wainwright field, said that undoubtedly the Wainwright well is the best that has yet been brought in, in the western Canadian field. The oil was found at the base of the Benton shale where it was not expected, plans having been made to drill to the Dakota formation. It is thought that greater production will be obtained in this field at greater depth. As it stands, however, it is the most promising that has been struck in this part of America, the Imperial Oil Co's well at Fort Norman having a capacity of 75 barrels a day while the wells in the Okotoks field are described as being more or less "freaks", gushing intermittently an oil that is almost a naphtha.

Naturally the event has caused excitement in Edmonton and other centres of northern Alberta. Officials of the Dominion Land Department at Wainwright found the entrance to their offices thronged when they came to open for business on the morning following the announcement. It was estimated that four thousand acres of land in the Wainwright district had been taken up by lease during the day. An excursion from Edmonton to the new well, which was arranged several days later, took hundreds of people to the scene. For their benefit the "gusher" was permitted to "gush" and newspaper correspondents wrote columns of "human interest" accounts of how oil shot above the ninety-foot derrick, plastering the latter with chocolate colored oil and covering the ground with pools of the precious liquid — demonstrating beyond cavil that northern Alberta has a real producer."

There are various estimates of the production possibilities of the well. At first it was placed at 100 barrels a day but subsequently that figure was doubled and it is maintained by some that 300 barrels a day will be found to be more nearly correct. The oil is lighter than that of Texas and certain districts of California and its gravity about 18 or 29 degrees Beaume. The pressure is about 500 pounds, according to Mr Campbell. This is considered about right to keep the oil flowing freely.

Mr. Stutchbury in Ontario.—Howard Stutchbury, coal commissioner for the Province of Alberta, has started East to make a lecturing tour of the Province of Ontario, his subject being the quality of the coal produced in Alberta and the advantages that may be expected to accrue to Ontario consumers through its use.

Alberta Coal Well Received.—The trial shipment of Province of Alberta coal to the Province of Ontario appears to have been successful in winning popularity for the western production in the eastern market. The Natural Resources Intelligence Service Department of the Interior, Ottawa, has issued figures showing that nearly 150 carloads were shipped of which London took 17, Guelph, 10; Toronto, 5; St. Thomas, 4; Ottawa and Hamilton, 3 each; Oshawa, Owen Sound, and Port Hope, two each. These figures include "reorders" which, it is stated, were "the rule."

NOVA SCOTIA

Commission Finishes Sittings.—The Royal Commission finished taking evidence in Sydney today when General Superintendent Bischoff appeared and gave his views on the period of agitation covering the February and the July strikes at the steel plant. The enquiry was most thorough and while the majority of the local public believe it was rather belated, yet the atmosphere has been cleared and many workmen have had an opportunity to air their grievances, both real and imaginary.

High Wages Today—Mr. F. W. Gray in his evidence pointed out that wages today are 36% higher than during the war and 11% higher than the war peak wages, because the cost of living was relatively lower. He presented a comparative statement of wages and cost of living to back up his assertions. A number of men contended that the cause of the trouble was due to small wages and the difficulty of getting their grievances before the officials. Quite a number of workmen expressed very favorable opinions of the General Works Committee plan and said that it would, if given a fair trial, work out to the best interests of employer and employee.

Non-Recognition of Union—The labor leaders blamed the Company for not recognizing the Union, while much of the evidence went to prove that the Union failed to control their members and that orders to refrain from the use of force in restraining men from working during the strike were more honored in the breach than in the observance.

Rioters Sentenced—One feature of the case which stood out prominently during the sittings of the Commission was the fact that some of those who raided the different departments of the steel plant to drive men from their work have been sentenced to several years in the penitentiary, their cases having been before the courts for some time.

Good Feeling in Wage Conference—Negotiations on a new wage agreement between the United Mine Workers of District No. 26 and the British Empire Steel Corporation have been opened up. We are not in a position to state the basis of agreement offered by either side, but we do know that the spirit animating all the representatives taking part in the discussions is much different from that shown in the last joint discussion. The offensive attitude of some of the labor

leaders has been dropped and a seriousness becoming to thenature of the case is being shown. The general opinion is that negotiations should be so conducted that good-will will be promoted; then, when the matter is settled, a spirit of harmony will pervade the colliery organizations and the whole community will profit by the understanding reached. There is no general feeling in favor of a strike among the workmen, for most of them realise that there has been far too much loss of time in the past three years through the rashness of their leaders. While all will gladly accept an increase in wages if freely granted, the majority of the workmen are ready to work on and wait for a more suitable season to enforce or press their demands.

Saner Leaders—The leaders themselves are fully alive to the fact that it is a mad policy to try to hold office by dangling large increases before the eyes of the workmen. Since ever the United Mine Workers union was organizd in Nova Scotia this has been done, and it was one long war dance, each leader trying to outdo the other before the eyes of the braves for the position of "Big Chief." But it led some over the edge of the precipice, and one into quiet and enforced seclusion; and although two or three did survive and get back on the executives, the rope still dangles on the brow of the cliff.

The Pruning Hook—One thing that the mine workers cannot fail to notice is the great amount of pruning being done by the Steel Corporation. Whether all of it is necessary or in the best interest of good business, is no part of this argument. The fact is that it is being done with the object of cutting down expenses and lowering the cost of production shows that an attempt is being made to put its coal and steel industry on a competitive basis. If, therefore, retrenchment is being made on such a large scale, it is reasonable to suppose that no general increase in the wage rates can be given at this time.

Too Many Datal Men—There is one feature which will be kept in sight by both parties in striving after results, that is, the balance of labor. No doubt it has been pointed out by both the expert American mining men and by President Lewis that the proportion of datal men to undercutters is far too large and the number of datal men should be largely reduced. Mr. Lewis in 1909 pointed this out. But it is one thing to see these things and another to change them and keep the collieries' outputs up. Conditions differ in different coal fields. Our American neighbors seem to be "favorites of fate" in this respect. We of the East are not caressed in pleasure's lap, and it is just as much the duty of labor leaders to consider the condition under which a coal seam can be mined as it is to consider the wages paid to those working the mines. If the conditions under which coal is mined are harder in Nova Scotia, let the International union recognize this and, out of their wide experience and their knowledge of mining and industrial conditions generally, step in and help to put the industry on a basis where it can not be be menaced continuously by competitors and thus caused to lead a precarious life.

Steel Plant Busy—All departments of the Sydney steel plant, the rail mill excepted, are working steadily, and there is more real contentment among the workers than has been for the past three years. Rail orders are scarce, however, and now that the heavy "H" beams for the new colliery have all been finished, the mill is idle. The rail mill workers are employed on the smaller mills.

A large exhibit of steel products has been prepared and labelled for the British Empire Exhibition to be held in London next year.

Coke for Domestic Use—Satisfactory progress is being made in the sale of Sydney coke. The sales so far have been largely confined to the Maritime Provinces. No difficulty has been experienced in getting dealers to handle the product and these could sell more than they can get. With the new battery of ovens going, there will be a larger supply, which should come near meeting the demand. It is understood that coke will be sent to Quebec province shortly and arrangements are now being made to handle it there.

As the domestic use calls for different sizes, coke from the new battery will be crushed and assorted. So far only coke breeze could be spared, but the provision of lump coke will no doubt pave the way for a steady trade in the near future.

SAFETY FIRST COMPETITION

It is announced in the **Granby News of Anyox** that the prize offered by the Granby Company for the best definition of "What Safety First Means to Me," has been awarded to T. M. McAuliffe of the Mine. It is given below, as well as one which came a close second sent in by Mr. L. Waide, also of the Mine. While there were a number of good efforts in this competition from the Beach, the two published below have been judged the best.

What Safety First Means to Me
By T. M. McAuliffe

It is the natural law of Self Preservation.
It is the Antithesis of Ennui and Bravado.
It forms a Stepping Stone to Remunerative Effi ciency.
It Visualizes the Fact that an Injured, Careless Monetary Sympathy.
Worker seldom deserves, and rarely receives, Moral or Collectively it Emphasises the Continuity of Employment.

What Safety First Means to Me
By L. Waide

I appreciate and Value every Little Wonder that Nature gives me:
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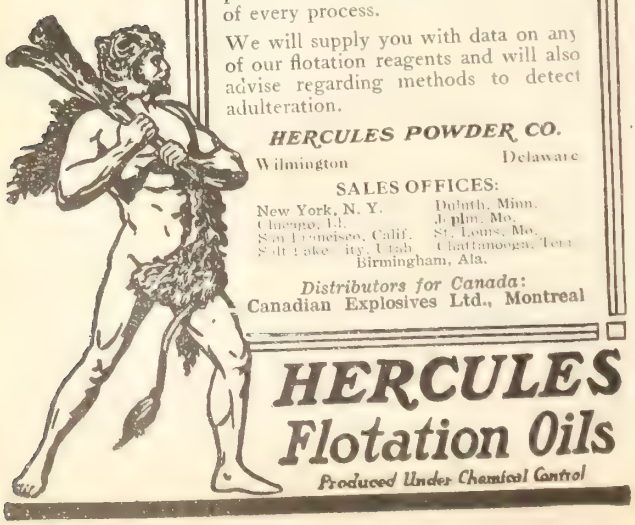
At copper mines, many old dumps, stope fillings, and similar accumulations of low-grade copper-bearing material, formerly regarded as waste, may now, under proper conditions, be leached in place, states the United States Bureau of Mines. A large copper company is now leaching its old caved areas successfully. Its officials have been given all the encouragement and assistance the Bureau of Mines could fittingly render; they have become convinced of the necessity for close technical control of their solutions to prevent loss, and are giving the Bureau facilities for studying the beginning of what appears to be an important means of saving low-grade values.

Discussing the work of the British Imperial Conference, this week's *European Commercial* states: "There are, at the present time, advocates of a completely self-contained British Empire. They would like to see a detailed system of Imperial preference set up with the ultimate object of securing the exclusive use or British products in the Dominions and vice versa. For ourselves, we look at the matter mainly from the European point of view. The British Empire cannot absorb its own output, and, as this is principally designed to appeal o purchasers on a high plane of civilization, the markets of Europe must be taken into consideration in an ever increasing degree. Nor can the flow of goods be in one direction only, and if Europe is to purchase from Britain and the British Empire, these latter must purchase European products in return. The restoration of Europe is a concern of the most vital importance not only to Britain, but also to the Dominions."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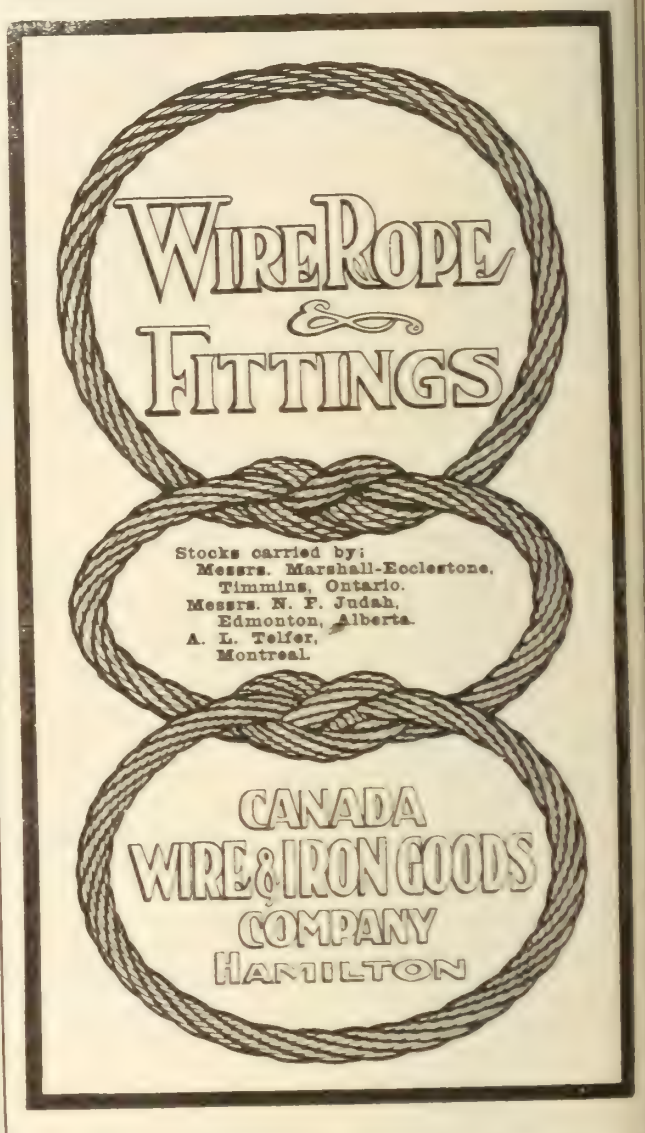

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Summary Report of Investigations made by the Mines Branch during the calendar year ending Dec. 31, 1921.

Phosphate in Canada, by H. S. Spence.

The Preparation, Transportation and Combustion of Powdered Coal, by John Blizard.

Road Materials along the St. Lawrence River, from Quebec Boundary to Cardinal, Ont., by R. H. Picher.

Barium and Strontium in Canada, by H. S Spence.

The Coal-fields and Coal Industry of Eastern Canada, by F. W. Gray.

Analyses of Canadian Fuels. Part I to V, by E. Stansfield, M. Sc., and J. H. H. Nicholls, M. Sc.

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Applications for reports and particulars relative to having investigations made in the several laboratories should be addressed to The Director, Mines Branch, Department of Mines, Ottawa.

GEOLOGICAL SURVEY

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Memoir 108. The Mackenzie River Basin, by Charles Camsell and Wyatt Malcolm.

Memoir 127. Beauceville map-area, Quebec, by B. R. MacKay.

Memoir 128. Winnipegosis and Upper Whitemouth River areas, Manitoba, Pleistocene and Recent deposits, by W. A. Johnston.

Memoir 129. Geology of the Moncton map area, by W. J. Wright.

Memoir 130. Geology and mineral deposits of the Bridge River map-area, British Columbia, by W. S. McCann.

Memoir 131. Kenogami, Round and Larder Lake areas.

Memoir 132. Geology and ore deposits of Salmon River district, British Columbia, by S. J. Schofield and G. Hanson.

Memoir 133. The southern part of the Sydney coal field. Nova Scotia, by A. O. Hayes and W. A. Bell.

Map 68A. Moncton, New Brunswick. Geology.

Map 155A. Portions of the districts of Algoma, Sudbury and Timiskaming, Ontario. Geology.

Map 1585. Mackenzie River basin, 1922 edition. Geology.

Map 1751. Wainwright, Alberta. Topography.

Map 1752. Monitor, Alberta and Saskatchewan. Topography.

Map 1767. Sydney, Nova Scotia. Geology.

Map 1830. Vermilion; townships 47 to 55, ranges 5 to 10, west of the fourth meridian. Topography.

Map 1831. Vegreville; townships 47 to 55, ranges, 11 to 16 west of the 4th meridian, Alberta. Topography.

Map 1860. Keno Hill area, Mayo district, Yukon. Geology.

Map 1948. Wanapitei Lake area, Ont. Geology.

Map 1964. Brockville-Mallorytown area, Leeds county, Ontario. Geology.

Map 1965. Fraser River delta, British Columbia. Geology.

Map 1972. Michipicoten area, Ontario. Geology.

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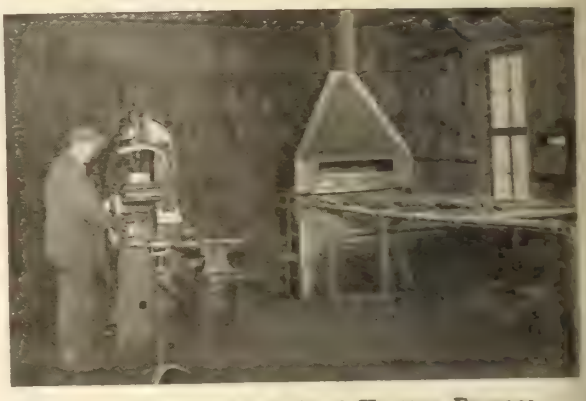

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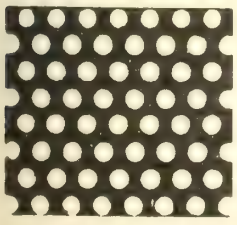

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Hebert, Alfred, Limited.
Holman Bros. Ltd.
Powley & Moody, Limited.
Sullivan Machinery Co.

Coal Screening Plants:
Link-Belt Limited.
Canadian Mead-Morrison Co.

Cobalt Oxide:
Deloro Smelting & Refining Co., Ltd.

Compressers — Air:
Belliss & Morcom, Ltd.
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Denver Rock Drill Mfg. Co.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Laurie & Lamb.
Smart-Turner Machine Co.
Peacock Brothers, Limited.

Concentrating Tables:
Herbert, Alfred, Limited.
Holman Bros., Ltd.
The Mine & Smelter Supply Co.

Concrete Mixers:
Canadian Fairbanks-Morse Co., Ltd.
Gould, Shapely & Muir Co., Ltd.

Condensers:
Canadian Ingersoll-Rand Co. Ltd.
Belliss & Morcom, Ltd.
Laurie & Lamb.
Peacock Brothers, Ltd.

Condensers — Electrical Static & Power:
Griswold & Co.

Consulters and Engineers:
Milton Hersey Co., Ltd.

Conveyors:
Link-Belt Limited.
Canadian Mead-Morrison Co.
Jones & Glassco (Regd.).

Conveyor Belts:
Canadian Fairbanks-Morse Co., Ltd.
Gutta Percha and Rubber, Ltd.

Conveyor Flights:
Hendrick Manufacturing Co.

Conveyor — Trough — Belt:
Dodge Manufacturing Co.
Link-Belt Limited.
Hendrick Mfg. Co.
Jones & Glassco, Regd.

Copper:—
Consolidated Mining & Smelting Co.

Countershaft Fixtures:
Dodge Manufacturing Co.

Couplings:
Dodge Manufacturing Co.
Hans Renold of Can., Ltd.

Cranes:
Link-Belt Limited.
Canadian Mead-Morrison Co.
Peacock Brothers, Limited.

Crane Ropes:
Allan Whyte & Co.
Canada Wire & Cable Co.
Greening B., Wire Co., Ltd.

Crucibles:
The Mine & Smelter Supply Co.

Crusher Balls:
Canada Foundries & Forgings, Ltd.
Herbert, Alfred, Limited.
Holman, Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
Peacock Brothers, Limited.
The William Kennedy & Sons, Ltd.

Crusher Jaws:
Canadian Steel Foundries, Ltd.
The William Kennedy & Sons, Ltd.

Crushing Rolls:
Canadian Steel Foundries, Ltd.
The William Kennedy & Sons, Ltd.

Crushers — Jaw & Gyratory:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Herbert, Alfred, Limited.
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Lymans, Limited.
The Mine & Smelter Supply Co.
Hadfields, Limited.

Cut Gears:
Hans Renold of Can., Ltd.
Jones & Glassco, Regd
The William Kennedy & Sons, Ltd.

Cyanide:

Cyanide Plant Equipment:
The Dorr Co.
The Mine & Smelter Supply Co.

Diamond Drill Contractors:
Smith & Travers
Sullivan Machinery Co.

Diesel Engines:
Belliss & Morcom, Ltd.
Canadian Fairbanks-Morse Co., Ltd.
Laurie & Lamb.
Lammers & Maase, Ltd.

Dies:
Canada Foundries & Forgings, Ltd
Herbert, Alfred, Limited.
Hull Iron & Steel Foundries, Ltd.
Holman Bros., Ltd.

Dredging Ropes:
Allan Whyte & Co.
Greening, B. Wire Co., Ltd.

Dredges:
Canadian Mead-Morrison Co.

Dredger Pins:
Hull Iron & Steel Foundries, Ltd.

Dredging Machinery:
Hadfields, Limited.
Hull Iron & Steel Foundries, Ltd.

Drills — Air and Hammer:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Herbert, Alfred, Ltd.
Hardy Patent Picks Co.
Sam'l Osborn (Canada) Ltd.
Holman Bros., Ltd.
Sullivan Machinery Co.
The Mine & Smelter Supply Co.

Drills — Core:
Canadian Ingersoll-Rand Co., Ltd.
Herbert, Alfred, Limited
Holman Bros., Ltd.
Sullivan Machineery Co.

Drill Steel Furnaces:
Canadian Ingersoll-Rand Co., Ltd.
Denver Rock Drill Mfg. Co.
Hardy Patent Picks Co.
Sam'l Osborn (Canada) Ltd.
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Holman Bros., Ltd.
Sullivan Machinery Co.

Drills — Diamond:
Sullivan Machinery Co.

Drill Steel — Mining:
Canadian Ingersoll-Rand Co., Ltd.
Hadfields, Limited
Mussens, Limited

Drill Steel Sharpeners:
Canadian Ingersoll-Rand Co., Ltd.

Drills — Electric:
Canadian Fairbanks-Morse Co., Ltd
Herbert, Alfred, Limited
Holman Bros. Ltd.
Sullivan Machinery Co.
Northern Electric Co., Ltd.

Drills — High Speed and Carbon:
Canadian Fairbanks-Morse Co., Ltd.
Hadfields, Limited
Hardy Patent Picks Co.
Sam'l Osborn (Canada) Ltd.
Herbert, Alfred, Limited
Holman Bros, Ltd.

Ejectors:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd

Electric Condensers:
Griswold & Co.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Herbert, Alfred, Limited
Holman Bros., Limited
Northern Canada Supply Co.

Electric Hoists:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Mead-Morrison Co.

Elevators:
Dodge Manufacturing Co.
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Laurie & Lamb.

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Canadian Sirocco Co., Ltd.

Engines, Diesel:
Canadian Fairbanks-Morse Co., Ltd.
Belliss & Morcom Ltd.
Laurie & Lamb.
Lammers & Maase, Ltd.

Engines — Gas and Gasoline:
Canadian Fairbanks-Morse Co., Ltd
Belliss & Morcom, Ltd.
Sullivan Machinery Co.
Gould, Shapely & Muir Co., Ltd
Laurie & Lamb.
The Mine & Smelter Supply Co
Powley & Moody, Limited.

Engines — Hauling:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd
Powley & Moody, Limited.

Engines — Steam:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd
Laurie & Lamb

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Dorr Co.
Ferrier, W. F.
Hore, R. E.
Heves & Sons, Thos.
Hersey Co. Ltd., Milton
McEvoy, James C.
Rogers, George R.
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Canadian Sirocco, Ltd.

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Canadian Steel Foundries, Ltd

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Dodge Manufacturing Co.
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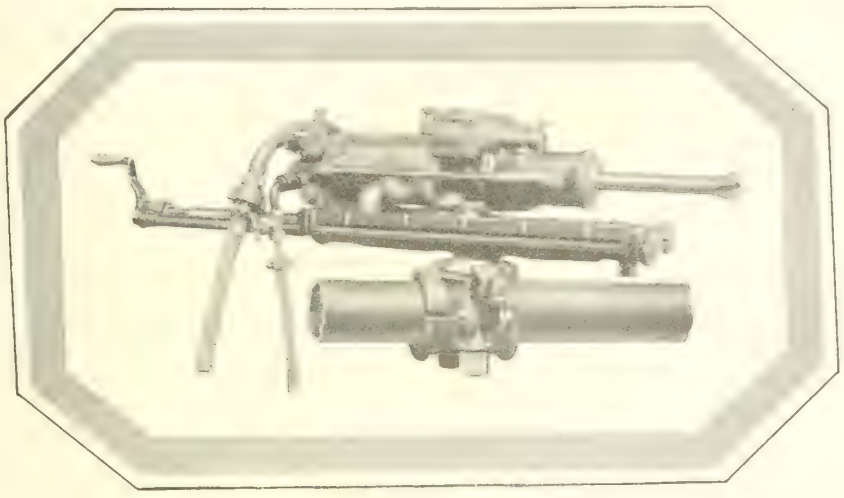

A Tri-State Tribute

AGAIN this year, for the third successive time, the Waugh Model 21 Turbro has emerged triumphant from the Tri-State rock-drilling contest a grilling ordeal for both men and machines, which is also recognized everywhere as a sound criterion of drifting-drill merit.

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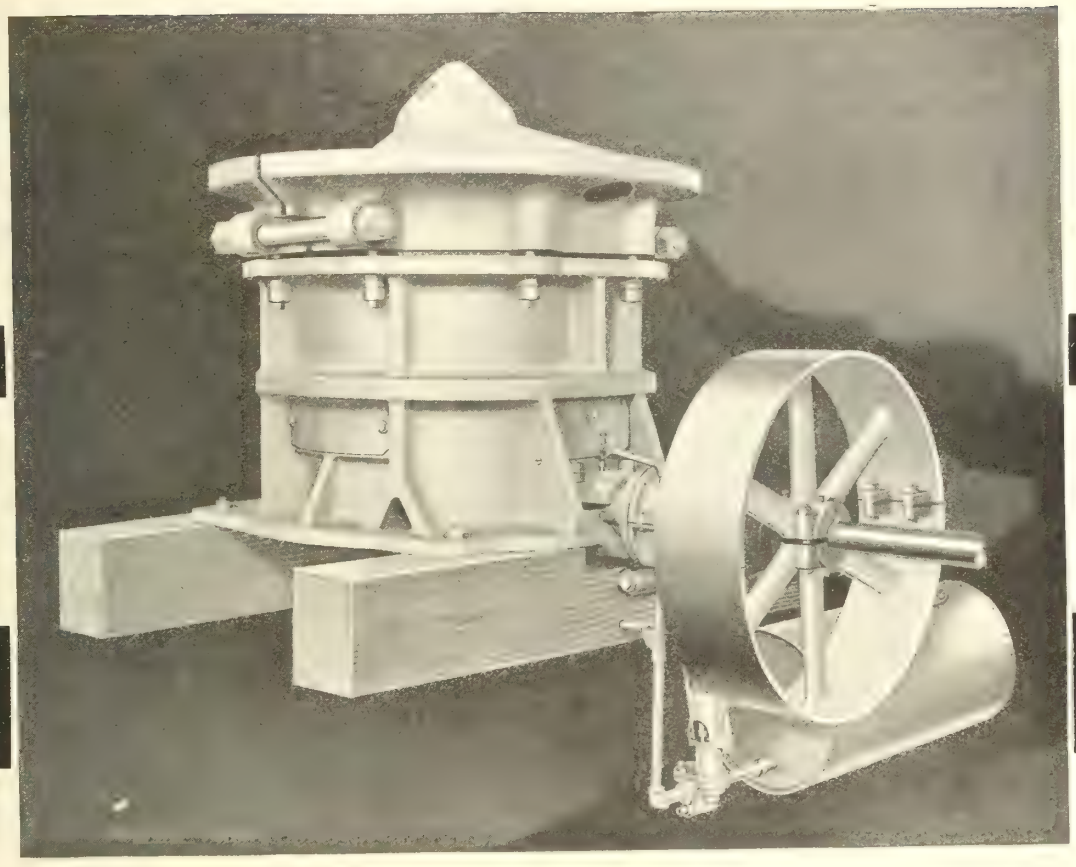

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For every shutdown of its crushing plant it costs the big mine $8.00 a minute. Another large operator figures his costs for lost time somewhat higher.

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C. F. - 112

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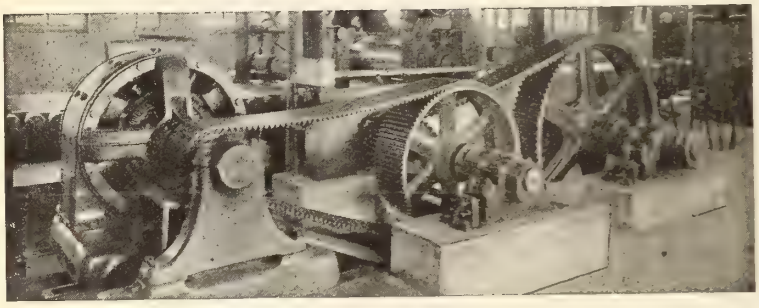

A few of the Morse chains in use at the Raymond Lead plant

Using chain drives speeds up production, cuts belt expense and overtime wages and operates with practically no repairs.

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"When we moved into our present plant thirteen years ago, we installed the present Morse equipment of silent chains for our two lead mills and ten hydraulic pumps. We had always previously used leather belts, but not without considerable trouble. For instance, if the operator was not careful — and gave the motors too great a load, the leather belt would slip and in some cases burn out. While with the Morse Chain Drive we overload them at times up to 15 H.P. without the slightest trouble.

"When we used leather belts on the hydraulic pumps, if a pump packing suddenly gave way, the water would squirt all over the pump as well as adjoining pumps, causing the leather belts to get wet. This often necessitated a shut-down on 3 to 4 pumps to dry out each belt, thus causing a loss of time by the men, which resulted many times in paying overtime to catch up on the work. Of course, with our Morse Chain Drive we have no such trouble—this positive drive prevents slippage and is not affected by water.

"Leather belts lasted us 2 to 3 years at the most, while our Morse Chain Drives have already lasted 3 to 4 times that long and seem good for many more years. So Morse Drives have cut our expense materially, speeded up production, cut out overtime wages and saved floor space, for they operate on shorter centers."

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Ontario's Minerals

PROVINCE OF ONTARIO

Hon. CHARLES. McCREA, Minister. DEPARTMENT OF MINES *Thos. W. Gibson*

Mineral Areas

Ontario, with its 407,262 square miles, contains many millions of acres in which the geological formations are favourable for the occurrence of minerals 70 per cent of the area being underlain by rocks of pre-Cambrian age. The phenomenally rich silver veins of Cobalt, Gowganda and South Lorrain occur in these rocks; so also do the far-famed nickel-copper deposits of Sudbury, the gold of Porcupine and Kirkland Lake, and the iron ore of Magpie and Moose Mountain mines.

Economic Minerals

In addition to the above, practically all economic minerals (coal and tin excepted) are found in Ontario: — actinolite, apatite, arsenic, asbestos, cobalt, corundum, feldspar, fluorspar, graphite, gypsum, iron pyrites, lead, mica, molybdenite, natural gas, palladium, petroleum, platinum, quartz, salt, talc and zinc. This Province has the largest deposits on the continent of talc, feldspar, mica and graphite.

Building materials, such as ornamental marble, limestone, sandstone, granite, trap, sand and gravel, lime, Portland cement, brick and tile, meet every demand.

Mineral Production

Preliminary returns show the output of the mines and metallurgical works of the Province for the year 1922 to be worth $62,202,169, of which the metallic production was $38,190,711.

The following figures show the growth of Ontario's mineral industry by five-year periods since 1891 when a Bureau of Mines was first established.

Year.	Value.	Year.	Value.
1891	$4,705,672	1911	$41,976,797
1896	5,235,003	1916	65,303,822
1901	11,831,086	1918 (Maximum war output)	80,308,972
1906	22,388,383	1921	48,128,387
	Dividends.		

Dividends and bonuses paid to the end of 1922 amounted to $28,096,699 for gold mining companies, and $86,238,185 for silver mining companies or a total of $114,334,884.

Mining Regulations

A miner's license costs $5.00 per annum, and entitles the holder to stake out in any or every mining division three claims of 40 acres each. After performing 200 days' assessment work on a claim, patent may be obtained from the Crown on payment of $2.50 or $3.00 per acre, depending on location in unsurveyed or surveyed territory.

Assay Office

The Provincial Assays Office at No. 5 Queen's Park, Toronto, is maintained by the Department of Mines for the free identification of minerals, free assays under the provisions of the Mining Act of Ontario, and also for general assay work as per the Schedule of Charges which may be obtained on application.

Temiskaming Testing Laboratories

The Department maintains, at Cobalt, an ore sampling and testing laboratory which is now prepared to receive parcels of gold ore from 100 pounds upward, and after sampling and assaying the same to pay to the shipper the value thereof, less treatment charges. The purpose is to afford a market for ores extracted by prospectors and others in developing their mining claims, enabling them to obtain funds which they can use for further work and to report on the most satisfactory method of treatment. Fuller information may be obtained on application to the Manager, Temiskaming Testing Laboratories, Cobalt, Ontario.

Publications

For list of publications, illustrated reports, geological maps and mining laws, apply to

Thos. W. Gibson,
Deputy Minister of Mines,
TORONTO, CANADA

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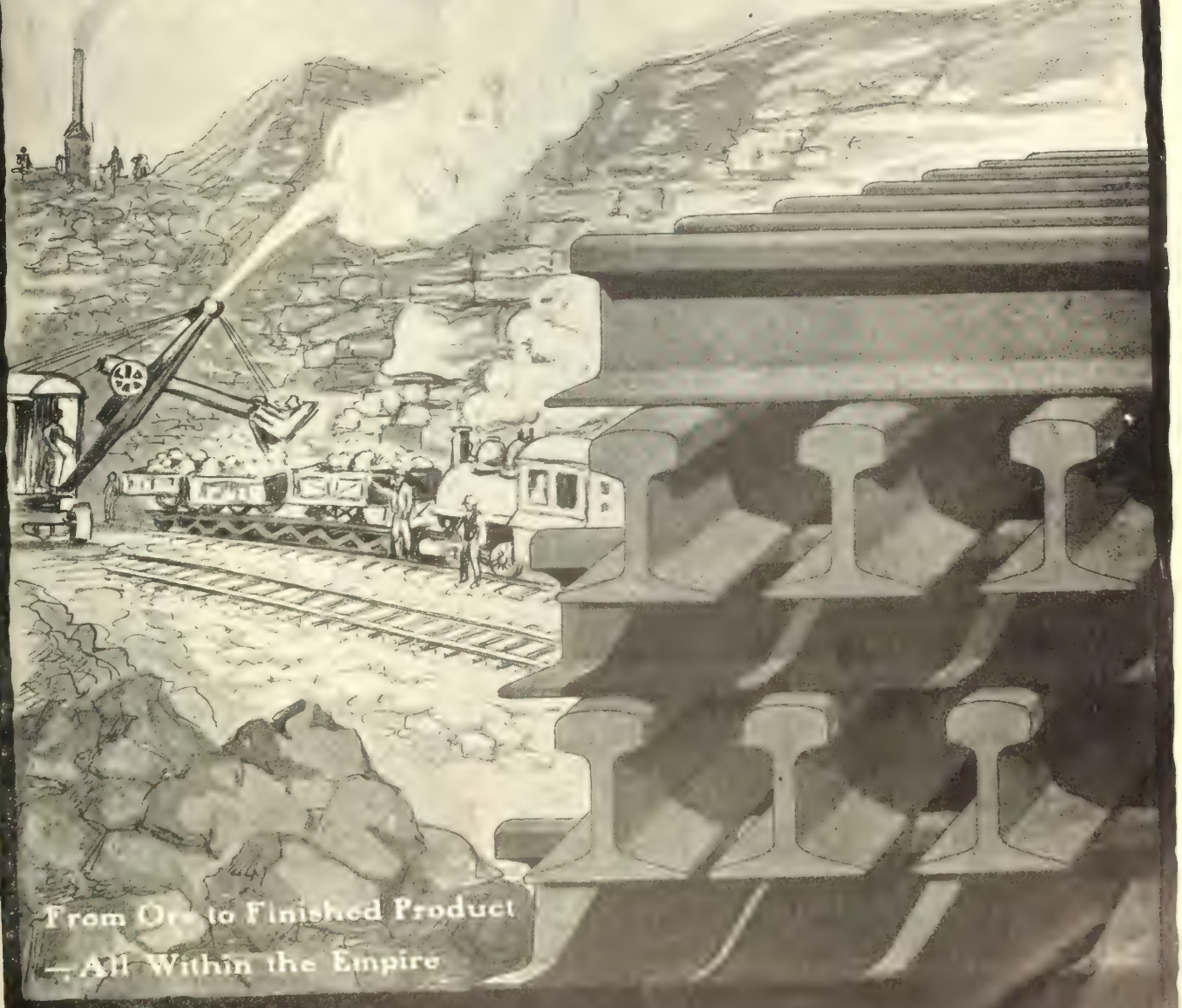

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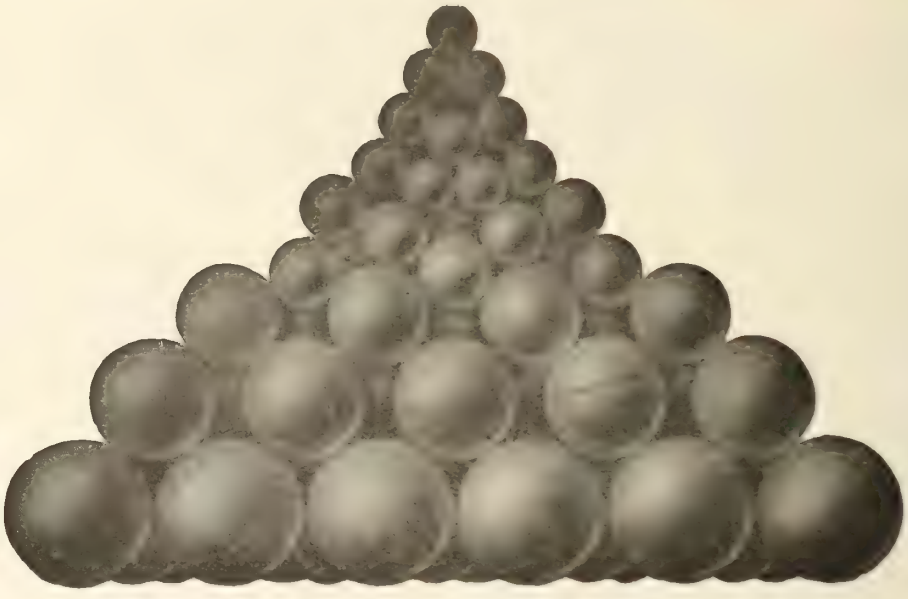

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CANADIAN MINING JOURNAL

PUBLISHED WEEKLY

Devoted to the Science and Practice of Mining, Metallurgy and the Allied Industries; and more particularly to their progress in Canada

VOL. XLIV. Gardenvale, Que., December 14th, 1923 No. 50

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The Editor cordially invites readers to submit articles of practical interest which, on publication, will be paid for.

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Adding Impetus To The Development of Mining

The development of Canada's enormous natural resources will affect her whole future. Her vast mineral wealth, as yet practically untouched, is to-day attracting world-wide interest from far-seeing investors.

It is appropriate that the Imperial Bank, whose policy has ever been to concentrate exclusively on Canadian affairs, should be powerfully furthering that interest. This Bank, by placing branches at strategic points throughout the mining districts, has materially aided the whole industry.

Those who contemplate becoming connected in any capacity with mining would be well advised to take advantage of this Bank's facilities.

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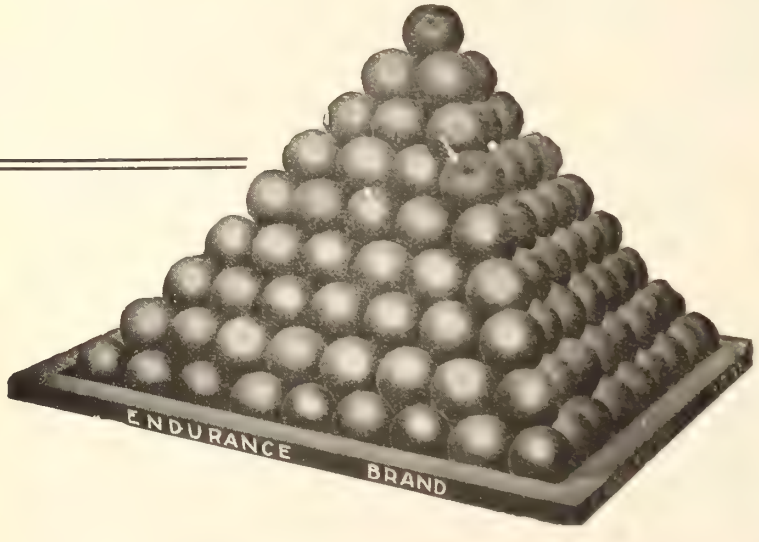

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:-: EDITORIAL :-:

TAX RATE SHOULD BE FIXED

The government at Quebec has not yet announced e method or the rate of taxation it will impose upon e prospective gold mines of the province. That gold ning, along with all other industrial undertakings the province, must bear its share of the burden of xation, one must take for granted; but those who ve invested in the development of gold prospects d who expect to expend larger and larger sums to velop mines and build mills, as occasion may warnt, are faced with an undetermined liability. They do not know what share of their output or of their ofits the provincial government will demand.

This is one of the problems the government at Que- will have to face eventually; and the sooner it nfers with all concerned and reaches a decision, the tter will all be pleased. It requires a very substanal investment to bring a new gold mine to the point production, even if exploration should have the st favourable outcome possible. Those who will t up this money will want to know, naturally, what eir liability is in the way of taxes. It is quite posble that the occasion for this investment will arise thin the next six months. It is, therefore, incumnt upon those responsible at Quebec to "get busy."

There is one point that seems to warrant mention w. The natural tendency of those who formulate x regulations is to impose a flat rate on production. his is the simplest and most direct way of comput- g and collecting a tax; but it is by no means the st. It has been demonstrated by the history of gold ning in Ontario, for instance, that a flat tax or yalty on production hung like a dead weight round e neck of the industry. The present graduated tax profits is more equitable, and has aided numerous ld mines that were originally of doubtful value to ach a profitable. and taxable, position.

DEPARTMENT OF MINES REPORT

The annual report of the Department of Mines, tawa, for the fiscal year ending March 31st, 1923, s just been issued. It is a document whose imrtance is seldom matched by the publicity it reives; therefore we shall give it some attention here. In his brief report, the Deputy Minister, Dr. Charles msell, touches on the principal problems the Dertment has undertaken to investigate. He first ms up the situation thus:

"The mineral resources of Canada are among its greatest natural assets, and, owing to our natural climatic conditions and the relatively limited area of the country capable of agricultural development, the mining industry must necessarily occupy a relatively larger place in our economic development than in those countries of the world more fortunately endowed with respect to climate. Mining is not affected by climate and can be carried on irrespective of it. The importance of this industry is indicated by the growing increase in the annual production of minerals per capita, which has risen during thirty-five years from $2.23 to $26.40 a head of population. This curve of production is increasing from year to year until it should ultimately exceed that of any country in the world. The two essentials to increased mineral production are markets and capital. Under present conditions the former is the more important and is necessary to encourage the latter. Owing, however, to the conditions mentioned above, namely adverse tariffs or the conditions of exchange, foreign markets are today difficult for us to enter. It is urgently necessary, therefore, that we should develop home markets by the establishment of industries complementary to the mining industry, so that the products of our mines may be utilized for manufacture into finished articles. A study of our mineral trade balance will show several instances where the raw material for a manufactured article is produced in this country, but is shipped outside for manufacture and is then sold back to us at many times the value of the material in it. The securing of capital for the development of these complementary industries appears to be more in the general interests of the country than capital for the production of raw material, and until those complementary industries are established in our own country the production from the mine will not increase to a stage bearing a proper relation to what we believe to be our potential resources."

Following up his own suggestion, Dr. Camsell mentions the work of the Dominion Fuel Board in providing Canadian fuel for Canada, and that of the Mines Branch in investigating and aiding the establishment of native industries using our own minerals.

In reporting for the Geological Survey, the Director Dr. W. H. Collins, stresses the need for accurate maps as does also Mr. W. H. Boyd, Chief Topographical [illegible] the Survey. Mr. Boyd [illegible]

to pre-war strength and the work is progressing satisfactorily. While the geological field work has the economic end as its chief object, the purely scientific aspects are by no means neglected.

In his report for the Mines Branch, Dr. John McLeish, Director, points out that, while our mineral production for 1922 reached the respectable total of $183,000,000 and our exports of mineral products (including those partly or completely manufactured) was $115,000,000, our imports of minerals were $282,000,000. His Branch is particularly charged with the responsibility of reducing this huge total of imported minerals, much of which is available at home if only we would take the pains to use it. To help the public to investigate and use our own minerals there is available the aid of the Branch's five divisions, namely the Division of Mineral Resources, which reports upon mineral resources in general; the Ore Dressing and Metallurgical Division, which investigates methods of treatment; the Fuel Testing Division; the Ceramics and Road Materials Division; and the Chemical Division, concerned chiefly with analysis.

The Department of Mines includes also the Explosives Division, in charge of Lt.-Col. G. Ogilvie, which licenses and inspects all explosives factories in the Dominion, of which there are now sixteen. The Dominion of Canada Assay Office in Vancouver is another branch of the Department of Mines that is seldom noticed except by those directly concerned. During 1922 it received gold and silver of a total value of over two million dollars.

A USELESS ROAD

The plans for a first-class winter road to the goldfield of northwestern Quebec have gone agley. On November 16th we announced the fact that Hon. J. E. Perrault had authorized the construction of a road from Angliers, the present terminus of the Canadian Pacific Railway line on the Quinze river, northward to the gold belt, by an all-land route. Either we were mis-informed at that time as to the route, or it has been changed subsequently. A contract has been let for cutting the road from Angliers to the Lonely river by land, whence it is the intention to put the road on Lake Opasatika for the remaining distance of sixteen miles to its northern end, where it touches the existing east and west road from Dane to Rouyn township.

At present supplies for the camps in Rouyn and Boischatel townships are being brought in by sleigh over the road from Dane on the T. & N. O. Railway, a total distance of close on sixty miles. The portion of the road from Dane to Larder is good; but from Larder to Lake Opasatika and Lake Fortune it is far from good. We climbed up and slithered down its hills recently, and have a wholesome respect for them. The load a team can draw over this road, even on sleighs, is ridiculously small, and the expense of bringing in supplies is correspondingly high.

On the southern route from Angliers there are no hills to contend with, and the provision of a good winter road would lessen materially the expense of supplies to the operators on the gold belt. Four shafts are to be sunk during the winter and a number of diamond-drills kept in operation. In addition mining machinery and a stock of supplies for the ensuing summer will be brought in. The expense of hauling all this material will be a considerable proportion of the total expense, and should be kept at a minimum.

If the road from the south runs the length of Lake Opasatika on the ice, it is doubtful whether the mine operators will be able to use it at all. A road on a large lake such as this is notoriously hard to keep open and it is impassable with heavy loads a good deal of the time on account of the slush that forms as the ice sinks with the weight of snow. The three mining companies operating on the gold belt are already using the road to Dane to bring in supplies, and it is more than likely they will continue to use it in preference to a road that runs the length of Lake Opasatika.

We refer to this point at some length because we were among those that urged the building of this winter road in the first place, and feel in some measure responsible for it. If its location remains botched, as at present, it seems possible that it will not be used and that the investment will be wasted. There is still time to save the situation by continuing the road sixteen miles by land northward from Lonely river to intersect the present road in Boischatel township. The cost of this would be in the neighborhood of $2,000—a bagatelle compared with the saving in freighting expenses that would result.

WOLF! WOLF!

The terrible wolves of our north country constitute an ever recurrent theme for newspaper writers as winter approaches. Probably Grimm's fairy tales and some ancient and honourable nursery rhymes are responsible, in the main, for these stories. The memories of Red Riding Hood and the big teeth that gobbled up the poor, old grandmother remain vivid in the imagination, and completely exclude the repeated statements of the human denizens of the north woods that wolves are a comparative rarity, and that dogs are more dangerous than their untamed relatives.

The wolf in northern Canada is one of the rarest of animals to be seen, and is the most fearful of man. Infrequently wolves are shot by skilled hunters, and sometimes they are trapped, though it requires more than the ability of the average trapper to deceive this wary animal. Often one hears the wolves howling, especially when in hot chase of a deer, their chief quarry; and sometimes on a still night they set up a brief chorus. But even the sound of the wolves is usually from a distance that is perfectly safe for them, and comforting to the wolf-shy greenhorn in the woods.

COMPANY MEMBERSHIP

Thirty representative members of the Institute have submitted an amendment to the by-laws, as announced in the December issue of the *Bulletin*. They propose that bona fide mining or metallurgical companies be authorized as members of the Institute, with the full powers and privileges of a private member, and that they be represented for voting by one who is already a member or associate member. The annual fee for company membership is to be $50.

This is a direct and straightforward bid for financial support from mining companies that feel able and inclined to contribute a modest annual sum to the Institute's coffers. The Institute requires urgently an augmented income, and the present proposal appears to provide a reasonable way of getting it. On first thought, such a request from the companies for an annual contribution (for it amounts to that) seems hardly in keeping with the Institute's dignity; but on reflection this appears a shallow view of the case. The Institute's stated reason for existence is to forward the interests of the mineral industry as a whole. These interests coincide, in most cases, with those of the companies whose operations constitute the industry. The companies have at present no official representation in the Institute, such as the Geological Survey and the Mines Branch at Ottawa have now. Nor have they the means at present of giving financial support to the organization that is fighting their battles and promoting the progress of technical efficiency. The stated and moderate annual dues proposed overcome the objection we have made on former occasions to gifts of money to the Institute's general fund.

The *Canadian Mining Journal* approves heartily the proposed amendment. Its adoption is likely to result in a moderate increase in the Institute's revenue, while it will leave unimpaired its prestige and usefulness.

CUSTOMS OFFICER IN NEW YORK

The government at Ottawa has at last announced its intention of stationing a Canadian customs officer at the port of New York to supervise shipments of Canadian goods from east to west of Canada, or vice versa, via the Panama canal. On several occasions during recent months we have pointed to the anomalous condition that exists at present, when only full cargoes between Canadian ports are immune from customs duties, while consignments on a vessel that discharges or takes on cargo at New York, the principal port of call en route, are liable to the full duties on foreign goods. The simple expedient of appointing a customs officer to supervise the loading and unloading of these vessels in New York, with a view to protecting the legitimate customs revenue, will solve the whole problem. The government has acted tardily but wisely.

TWO MORE GOLD MILLS OPERATING

All interested in Ontario's gold mining will watch with interest the progress of the new mills of Vipond and Night Hawk Peninsular, now tuning up for steady production. The Vipond mill already has a small production to its credit under a former management which failed to develop sufficient pay ore to keep it running. The present company has turned failure into success by judicious underground exploration, and has remodelled its 150-ton mill for the steady grind ahead of it. The Night Hawk Peninsular management has reported to the share-holders that there is plenty of ore in reserve to warrant its mill of 200 tons daily capacity, and that the grade is such as to afford a handsome operating profit. These two new producers will add a sum approximating $4,000 a day, or $1,250,000 a year, to the province's output of gold.

A SUBSTITUTE FOR THE LABOUR UNION

It is not many months since the Industrial Council plan proposed by Mr. Bischoff for the steel works in Sydney, Nova Scotia, was hooted and booed by the steel workers. At that time insurrection was in the air, and sane thought was a rarety. Now that the air has been cleared by the strike and its settlement, the Bischoff plan has been adopted with a marked measure of success.

With some unimportant exceptions, all are pleased with the new joint control of industrial relations. The old system of absolute rule by foremen, superintendents and managers is a relic of mediaeval times and is quite out of tune with democratic ideals. The modern system of joint control and combined responsibility is not only suited to the ideals of our times, but has been proved by practice to be entirely workable, if applied with reason.

The British Empire Steel Corporation have inaugurated in their steel works a plan of coöperation with their workmen that may well prove to provide all the genuine advantages of the labour union without including the features that have brought it into such serious disrepute.

COAL OUTPUT CLIMBING IN NOVA SCOTIA

Coal production in Nova Scotia this year will be at least 6,000,000 tons, according to the Hon. E. H. Armstrong, Premier of Nova Scotia and Minister of Mines for the province. As the total production last year was [illegible] tons, the increase this year will be the equivalent of [illegible] million tons. The collieries are in good condition and preparations are in progress for the opening of new mines.

DAILY OUTPUT OF RAND

The average daily output of gold from the Rand mines during September was [illegible] ounces, against [illegible] ounces a day in August. [illegible] were employed in the mines during September.

Recent Mining Developments in the Mayo District, Yukon*

By W. E. COCKFIELD

Last year the *Journal* published an account by the writer of the silver-lead discoveries of the Mayo district, Yukon. This district was revisited by the writer last summer and most interesting developments were seen.

Keno hill, which is situated 40 miles northeast of Mayo, is at present the most important mining centre in Mayo district, which district lies on the eastern boundary of Yukon and may be roughly defined as the watershed of upper Stewart river. The Stewart, one of the main tributaries of Yukon river, joins it 72 miles above Dawson. Mayo is situated 180 miles above the mouth of the Stewart river.

Communications

During the summer the White Pass and Yukon Company maintain a regular passenger and freight service on Stewart river, in connection with the boats on Yukon river. In winter passengers may reach Mayo by means of the mail stage which connects at Minto on Yukon river with the overland mail from Whitehorse to Dawson. Telegraphic communication between Mayo and Dawson has recently been established, thus furnishing communication between Mayo and outside points. Good roads have been constructed in Mayo district by the Territorial government, and a telephone line between Mayo and the mines has been installed by private enterprise.

Hitherto practically all hauling between the mines and Mayo has been done by horse-drawn sleds in winter. Last winter, however, the Treadwell Yukon Company, Ltd., introduced caterpillar tractors. These hauled the bulk of the ore shipped by this company and were entirely successful in operation, reducing the cost of haulage by approximately 50 per cent. As the cost of landing ore to Mayo previously represented nearly half the cost of shipping from the mines to the smelters, this reduction is quite substantial.

Production

The estimated production of Keno hill from 1920 to the spring of 1923 is 14,200 tons, having a total content of 2,890,000 ounces of silver valued at $1,900,000 and 14,300,000 lbs. of lead valued at $665,000. The production during the winter of 1922-23 was 61 per cent. of this total. For the coming winter a production of between 8,000 and 9,000 tons is expected.

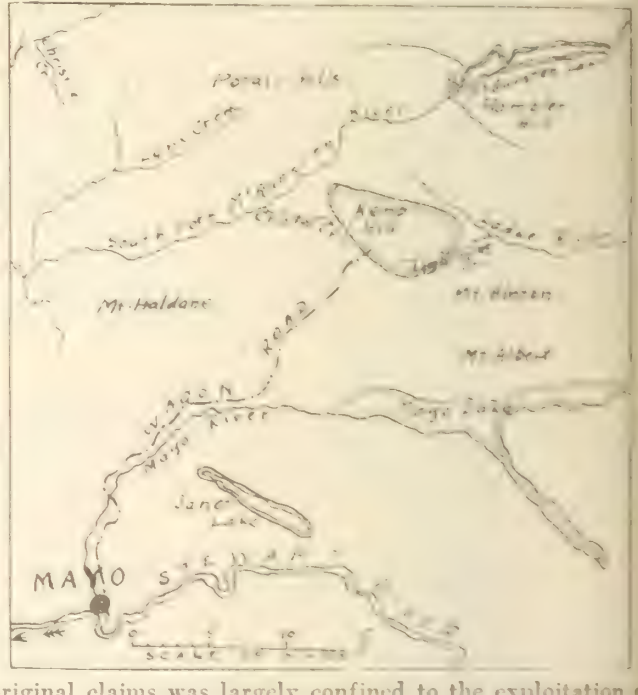
General Geology

The district is underlain by quartzites, quartz-mica schists, mica schists and graphite schists presumed to be pre-Cambrian in age. Intrusive into these schists are dykes, stills and laccoliths of greenstone which is also sheared. Dykes of quartz porphyry and granite porphyry cut both of these formations. These dykes are believed to be contemporaneous with a granite intrusive mass lying to the east.

The ore-deposits are mostly fissure veins or fault fissures filled with mineral. Two systems of mineral fissures have been recognized. The earlier has a general trend of north 30 to 40 degrees east and at the time of formation was mineralized with quartz and arsenopyrite. These veins probably served as the main circulation channels for the solutions during the mineralization of the second set of fractures and consequently contain some valuable deposits. The later series of veins make an angle of 70 to 80 degrees with the earlier series. The minerals of the second stage are chiefly galena, sphalerite, freibergite and siderite, with a little pyrite, calcite and barite. A third fracturing took place subsequent to the deposition of the ore-bodies, cutting some of the deposits into a series of fault blocks. Some of the veins, however, are quite undisturbed. This fracturing was accompanied by the deposition of quartz. In some places a slight secondary enrichment represented by native silver and ruby silver has taken place, but the effects of this are extremely localized.

Keno Hill, Ltd.

The original claims were staked close to the summit of Keno hill, and were bonded to the Yukon Gold Company, which later formed a subsidiary company, Keno Hill Ltd., to operate its claims on the hill. Other promising claims were also prospected by this company. The work on the original claims was largely confined to the exploitation of veins belonging to the second series as outlined above. These veins contained small ore-shoots of clean sulphides but the shoots as a rule were small. The bulk of the ore shipped came from vein No. 9, where the workings were carried to a depth of 400 feet; but below the second level (250 feet) the ore became disseminated, requiring concentration before shipment. Approximately 8,000 tons of shipping ore were extracted from this ore-shoot, and development work was suspended in order to open up the Sadie-Friendship vein on the western slope of the hill where the deposit gives more assurance of permanency. The possibilities of other ore-shoots in No. 9 vein have not been exhausted.



The Sadie-Friendship and Treadwell vein on the western slope of Keno Hill represents the most important addition to the Keno Hill camp since the original discovery, and gives promise of far surpassing the latter in produc

* Published with the permission of the Director, Geological Survey, Ottawa.

tivity. Discovered by accident in 1921, the vein has already been developed to such an extent that 4,300 tons of ore have been shipped. This deposit differs from most of the others on Keno hill in that it is a zone rather than a fissure vein. This zone follows closely a line of weakness represented by an older quartz-arsenopyrite vein, and has been found at points on the Sadie, Friendship, Bluestone, Ladue, and Lansing claims, and further outcrops possibly representing the same deposit occur on the Lake group to the north and east of the Lansing claim. As the surface is everywhere covered with tundra and as the vein is faulted considerably, the full extent of the deposit will not be known for some time.

The mineral zone is from 10 to 40 feet thick. The mineralization consists of galena, sphalerite, freibergite, siderite, calcite, barite, ruby silver and native silver. The clean sulphides do not occur as plentifully as in the veins on top of the hill, but by means of hand sorting, shipments of considerable size have been made. Plans for concentrating plants are now being considered and it is believed that such plants will lessen to some extent the cost of mining, as the whole deposit can then be mined.

Keno Hill, Ltd. has sunk three prospecting shafts on the Sadie and Friendship claims, and a short level was driven close to the surface from which 360 tons of ore were extracted. The property was not, however, adequately equipped with pumps and the workings filled with water and caved. With the closing of the properties on the top of the hill, however, power from the steam plant on Duncan creek has become available and a vertical shaft 200 feet deep is being sunk, with crosscuts to the vein at 70, 135 and 200 feet.

Treadwell Yukon

Treadwell Yukon Company, Ltd., has sunk two inclines of 280 and 175 feet on the Ladue claim. Levels connecting these have been driven at 50, 90, and 160 feet and from No. 1 shaft the 300-foot level is being driven in both directions along the vein. A drainage tunnel 3,000 feet long is also being driven to tap the vein at a depth of 500 feet. Recent reports state that this tunnel has already been driven 1,200 feet. This property is completely equipped with compressors, hoists and pumps.

Individual miners are also prospecting their claims, and a number of promising veins have been uncovered. During the winter of 1922-23 approximately 140 tons were shipped by individual claim owners, the Shamrock group situated near the original holdings of Keno Hill Ltd., and the Rambler group on the northern slope of Keno Hill being the chief producers. Further shipments from these sources are expected.

Other Occurrences

Veins similar to those on Keno hill have been found on Sourdough hill, lying to the south of Keno hill and on Galena hill, lying between Keno hill and the old Silver King mine, the first producer of high-grade silver-lead ore in the Mayo district. It is expected that in time further discoveries will be made. The country is difficult to prospect owing to the superficial deposits, which are largely frozen and require much work for their removal. This fact, coupled with the remoteness of the district, will tend to retard development.

A new and promising discovery of tinstone is reported from the Marranboy district in northern Australia.

A new occurrence of the banket reef, as yet of unproved value, has been found near the Wilge river, east of Pretoria, South Africa.

CONSOLIDATED CONTROL OF TOPOGRAPHICAL MAPPING IN OTTAWA

In every country surveys and maps are a necessity and this is particularly true of Canada with her great areas of undeveloped land. Three federal departments are, and have been for a number of years, engaged in making topographical surveys with three different objects in view. The Dominion Government, realizing the need of co-ordinating this work in order to secure the greatest measure of efficiency and economy, formed in 1922 the Board of Topographical Surveys and Maps.

The three departments and their fields of operations are as follows: the Department of National Defence has in mind the making of maps for militia purposes: it began the surveys for the series generally known as the "Militia Maps" in 1903. This series now covers approximately 40,000 square miles, mostly in the provinces of Ontario and Quebec. The Geological Survey of the Department of Mines has in view the use of maps for geological purposes, and commenced making topographical surveys in 1909; they have covered probably 35,000 square miles throughout various parts of the Dominion. The Topographical Survey of the Department of the Interior has in view maps for general purposes. In 1887 they commenced the photo-topographic survey of the Rocky mountains, which has been continued with interruptions up to the present time This survey now covers about 13,000 square miles and is confined, for the most part, to Dominion parks and forest reserves. For many years the Topographical Survey has issued the three-mile sectional sheets which cover a large part of Dominion lands in the western provinces. In 1919 it was decided to add complete topographical information to this series and up to the present time roughly 90,000 square miles have been surveyed.

By the Order in Council creating the Board of Topographical Surveys and Maps it is given authority to consider and advise upon all questions that may arise in relation to topographical surveys, the compilation of new maps, the modes of projection, the selection, unification, and improvement of scales and conventional signs, the representation of relief, the use of colours, and other geographical subjects. By means of the powers thus given it, the Board is bringing about a correlation of the work of these different organizations so that when any work is undertaken by one of them the work and needs of the others are fully considered.

The members of the Board are: Dr. Deville (chairman) and Mr. T. Shanks, of the Department of the Interior; Dr. W. H. Collins and Mr. W. H. Boyd, of the Department of Mines; and Colonel S. H. Osler and Major J. B. Cochrane, of the Department of National Defence.- Natural Resources (Ottawa.)

NOVA SCOTIA COAL SHIPMENTS TO ST. LAWRENCE PORTS

The [illegible] of the season have been shipped from the coal mines of Nova Scotia to St. Lawrence ports. The total [illegible] to the St. Lawrence ports [illegible] 1,100,000 tons. This is 84,000 tons in advance of last year, but is a smaller amount than was anticipated early in the season. The strike last summer caused many buyers to [illegible] from Nova Scotia to the United States.

Empire Resources in Oil

A Plea for the Commercial Exploitation of Torbanite

By E. H. CUNNINGHAM CRAIG, in "United Empire"

It is told of Pitt that, rising on one occasion in the House of Commons, he commenced his speech with the words "Sugar, Mr. Speaker"; at which some members were so ill-advised as to laugh. Whereupon, Pitt turned upon them in anger, and, raising his voice, reiterated "Sugar, sugar, sugar: who will dare to laugh at sugar now?" Those were the days when our West Indian sugar resources were a priceless asset, and before we had sacrificed our Colonial sugar trade to a craze for cheapness and an inferior product, the beet sugar of our Continental neighbours and rivals. To-day, oil in all its forms is of equal importance, not only to the Kingdom, but also to the Empire as a whole; and it is time, and more than time, that some statesman with as powerful a voice should rise in his place and begin with "Oil, Mr. Speaker."

Limited Empire Resources

Everyone now admits the importance of petroleum supplies; we have been told that "the War was won on oil"; but alas, it was only to a very small extent British oil. The world will always consume as much petroleum as can be supplied to it. Such temporary over-production as is taking place in the U.S.A. at the present moment only stimulates consumption, and brings the day when we shall want more than we can get so much the nearer. With a demand whose capacity for growth may, for all practical purposes, be regarded as unlimited, and with resources which, in spite of, or rather by very reason of, the development of new fields in Venezuela, Colombia, and elsewhere, are diminishing, surely it is obvious that, sooner or later—and it may be much sooner than is anticipated by many of our commercial magnates—a shortage is inevitable. And still, though the danger is evident, a policy of drift is tolerated, if not even encouraged.

During the War a golden opportunity was lost when no vigorous steps were taken to develop to the utmost our Imperial resources in sugar, with the result that the sugar market is now dominated by the price of sugar in Cuba, instead of in Hamburg as before the War, a change that certainly is little improvement from a British point of view.

In petroleum affairs a similar short-sighted policy was followed and another glorious opportunity lost. It is only by developing Imperial resources that the British Commonwealth of nations can regain and increase its ascendancy. But our Government delayed till far too late to take any action, and then, when stringency was acute, contented themselves with importing petroleum, and made but half-hearted and sometimes very ill-advised attemps to obtain supplies at home.

Advances in Research

The position is now somewhat different. Research has continued and has been giving results far in advance of anything hitherto achieved: the extraction of oil from retortable material is on a surer basis than ever before, and it is to this source of supply rather than to the development of oil-fields, that the writer wishes to draw attention.

The chief advances recently made are in our knowledge of retorting processes, and in the discovery of new methods of dealing with crude oils. Yields from retorts much better than those obtained by the late Petroleum Research Department have been got from the same materials, and this not on an experimental or laboratory scale, but in regular works practice dealing with large quantities. The difficulties of dealing with very rich material, which is apt to clog or choke the retort, have been successfully overcome. And there are two or three hydrogenation processes in operation by which it is said that not only light oils and petrol can be made cheaply from heavy crude oils, but the sulphur content can be greatly decreased, if not eliminated. These discoveries open up vast possibilities, the effects of which can hardly be gauged at present. Heavy oil may become more valuable than light, the sulphur bogey may be exorcised, and retorted oil may hold its own against free oil in all countries that are not favoured by nature with supplies of the latter.

Torbanite the Best Material for Distillation

It is to torbanites that we must look first, and later to cannels and oil-shales, for much of our Imperial supplies. Torbanites, as the richest source, must take first place. These interesting and little understood deposits have been studied very carefully in recent years, and research is still proceeding. Fortunately, the Empire is well supplied with them.

In New South Wales, the richest torbanite in the world, capable of yielding upwards of 130 gallons of oil per ton, has been worked for many years, but, unfortunately, the work has now been shut down, partly on account of the seam thinning out, but largely because old-fashioned methods of retorting were used that gave little more than 100 gallons per ton, and were, in addition, immensely expensive in operation. In South Africa, torbanite of excellent quality has been proved over a large area in the Ermelo district, and estimates of several millions of tons have been made. This torbanite yields some 90 gallons to the ton, and the quality of the crude oil is very good. In these two countries there is *no* indigenous oil to compete with that obtained by retorting, and all petroleum supplies have to be imported. There is not the least doubt that their deposits could be exploited so as to return handsome profits.

Torbanite in Nova Scotia

In Nova Scotia, seams of torbanite have been known for many years in the coalfields near New Glasgow. Some of these seams are very rich, good for from 50 to 80 gallons per ton; others, though very thick, are of poorer quality, but can be worked by quarrying instead of mining. None of them is being worked at present. In Great Britain, many torbanites of various degrees of richness were discovered by research work during the War, and torbanitic cannels were proved over a large area. A fairly complete survey was made of such retortable material, and sites were actually selected for retorting works, but little or nothing is being done at present to utilize such valuable material. Recent retorting tests on a large scale have shown that very good quality crude oil can be obtained from English and Scottish torbanites and cannels, and good prices can be realized.

Here, then, are undeveloped resources that are well worth the attention of anyone who has at heart the policy of making the Empire as far as possible self-supporting. In Australia, though one company has ceased operations, other and thicker seams of wonderful torbanite are known, but are not being worked. In South Africa the value of the torbanite seams is at last being appreciated, and active development will soon follow. In Nova Scotia, though

competition with imported oil will have to be faced, there is a great field for development, and excellent prospects of success.

New Interest in Great Britain

Even in conservative Britain, where several unsuccessful attempts have been made to start a retorting industry, the truth is gradually becoming known, and the value of torbanitic deposits learnt. The time-worn criticism that a thing cannot be done because it has never been done before has ceased to carry much weight in industrial circles. To develop Imperial resources of oil is the aim; and all these countries can contribute to what will amount in the end to a very respectable total. And the easiest and best material to deal with first of all is torbanite. Ordinary cannels and oil-shales will come later.

An Imperial Conference has been sitting in London. Among the delegates may we hope to find a statesman far-seeing enough to view the situation from an Imperial standpoint, and vigorous enough to translate his schemes into action, one whose voice will command a world-wide hearing as he thunders "Who will dare to laugh at torbanite now?"

THE USES OF MICA

As an insulating material in electrical apparatus and machinery sheet mica is used extensively. In fact, its most important use is in the electrical industry, where a non inflammable, resistant insulting material is necessary. Nearly every piece of apparatus and machinery utilizing electricity must have mica for insulation. In its resistance to puncture, infusibility, and imperviousness to moisture mica is an ideal insulator, and in addition it has physical properties—cleavage, transparency, toughness, hardness, elasticity, flexibility, and resonance—which are not found combined in any other substance. It is therefore serviceable for a variety of purposes, such as an electric insulating material in condensers for magnetos for the engines of automobiles, trucks, and airplanes; in condensers for radio-transmission apparatus; and in spark plugs for automobiles, trucks, and airplanes. Condenser mica must be clear, must split easily and smoothly into films as thin as one-thousandth of an inch, and must be free from cracks, holes, foreign substances, stains, spots, and smoke, and the sheets must be plane and smooth, free from waves, wrinkles, reeves, rulings, or knots.

Sheet mica and splittings are used as insulating material in the form of sheets, washers, and tubes in dynamos and in numerous electric fittings and appliances, such as electric heating devices,, electric-light sockets, spark plugs, guards in rheostats, fuse boxes and telephones. Flexible cloth and tape, partly made of or covered with mica, find varied uses in electric apparatus. Sheet mica is used for glazing in the fronts of stoves, in furnace sightholes, for screens in front of highly heated material, for optical lanterns as a retarder of heat waves, and for making lamp chimneys and lamp shades.

Amber Mica for Commutators

As an insulator between the copper segments of the commutators for direct-current dynamos and motors phlogopite or "amber" mica is said to be preferred, as muscovite or "white" mica, being harder, does not wear down evenly with the copper, leaving a ridge above the copper bar that would cause sparking and irregular running. For all other insulation, however, the domestic muscovite is satisfactory.

Phonograph or diaphragm mica must be of a very high grade, for it must be clear and transparent and must also be flat.

Mica for lamp chimneys and canopies must be clear and must split easily and be very flexible. Very little domestic mica can be used for this purpose. Indian and Brazilian mica are used instead.

For stove fronts a nearly clear mica, hard and rigid, is most desirable, and much of the North Carolina mica, especially the greenish, is well adapted for this use.

Mica Board

Sheet mica of an inferior grade and splittings (mostly in the form of built-up mica board) are also extensively used for general electric insulation. Muscovite and phlogopite mica are both suitable for building into mica board. This material is prepared by splitting the mica into thin sheets, systematically placing them together with shellac, and then subjecting the whole to pressure. In this way large composite sheets are made, which are as suitable as single sheets of mica for some insulating purposes. The mica boards manufactured by different concerns are known by special trade names, such as "micanite," "micasbeston," and "micabond."

Most of the mica splittings produced are consumed in the manufacture of built-up mica board, but some splittings are used as such in making mica tubes for spark-plug cores and other insulating uses, wrapping for wire coils, and insulating tape.

Ground Mica

Scrap mica, or mica that can not be utilized as sheet or splittings, is ground and sold in powdered form. Ground mica, usually coarsely ground, is used in patent roofing compositions, and for this purpose biotite or black mica is also suitable. The mica serves the purpose of keeping the material from sticking when rolled for shipping or storage. Ground mica is also used for decoration, chiefly in wall paper, fancy paint, ornamental tile, and concrete facings; as a lubricant; in annealing steel; and as an absorbent for nitroglycerin. Its heat-resisting qualities render it useful in railroad car-axle packings, in pipe and boiler covering, in fireproof paints, and in rubber tires. Nearly all the mica ground in the United States is obtained from the mining and manufacturing of sheet mica, being the waste obtained in mining and the waste and trimmings resulting from the cutting of the sheet mica. — U. S. G. S. Report for 1922.

THE STORY OF CEMENT

The Portland Cement Association, Chicago, which includes in its membership Canadian as well as [illegible] manufacturers, has issued a [illegible] entitled "Conquering Our Continent [illegible] Industry" by Edward Hungerford [illegible] American writer. In this Mr. Hungerford gives, in a vivid and non-technical style, the story of this vast [illegible]. He tells how the Concrete Age [illegible] out that, from a production of a million barrels of [illegible] in 1890, the output of [illegible] has risen to [illegible]. We must [illegible] glance about us wherever we happen to be, in city, farm or highway, to see the innumerable uses to which this cement is put. A recent advance in cement mill practice is the installation of waste heat [illegible] able of providing almost all the power required for the plant.

A Review of Canada's Mineral Industry

Prepared by the Mines Branch Department of Mines, for the National Resources Intelligence Service

The Natural Resources Intelligence Service, Ottawa, has just issued a most interesting and informing 220-page book, with illustrations and a map, entitled "Canada—Natural Resources and Commerce." Its object is well stated in the foreword thus:

"The Dominion of Canada is relatively a newcomer to the field of foreign commerce on an extensive scale. Her natural resources are still largely undeveloped, and by no means thoroughly known or appreciated even by Canadians. But the rapid exploitation of the past twenty years has clearly and strikingly revealed the national domain to be such—both in character and in extent—that its full utilization must inevitably spell for Canada a wide career in international trade, rather than an unique degree of self-sufficiency.

"With full appreciation of this all-important fact, the present volume, purposely very general and restricted in scope, has been prepared especially to afford those associated with international trade a concise review of the natural resources of Canada, and of the broad features which they impart to the commerce of the Dominion by their limitations as well as by their diversity and abundance."

The section on minerals and mining, which fills 24 pages, has been prepared by the Mines Branch of the Department of Mines. It gives an excellent bird's-eye view of Canada's mineral industry, and is reproduced hereunder.

Importance of Mineral Production

The importance of mineral resources in the economic structure of a nation has been vastly magnified in modern times, and has given rise to the axiom that coal and iron are the basis of industrial strength and progress. To coal and iron must now be added petroleum. In the possession of these three essentials of modern civilization, the continent of North America stands preëminent amongst the world's geographical areas. Canada, occupying the northern half of North America shares in the possession of enormous resources of coal in large resources of low grade iron ores which are already on the verge of successful commercial exploitation, and, it is confidently hoped, in great potential resources in oil.

It is, however, in respect to other products that Canada has hitherto contributed most heavily to the world's markets. Long before the exceptional production stimulated by the war, the Dominion had become the world's principal source of nickel, asbestos and cobalt, and an important producer of gold, silver, copper, lead, zinc, and a number of the rarer metals. Few countries possess greater coal resources, and the Canadian output of arsenic, chromite, feldspar, graphite, gypsum, mica, magnesite, pyrites, and talc stands high in records of the world's production. The mining areas of Cariboo, Klondike, Rossland, Anyox, Britannia Bay, Salmon River, Alice Arm, Portland Canal, Sudbury, Cobalt, Porcupine, Kirkland Lake, and, more recently, the newer gold areas in Ontario and Quebec, and the copper-gold-silver camps in Northern Manitoba have become familiar in the world's mineral markets.

The discovery of each new mineral district has been followed by great stimulation in mining activity, which, supplemented by the more prosaic mining of coal, asbestos, gypsum, salt, and the numerous other non-metallic products, has resulted in rapid increase in the total annual value of Canada's mineral production during the past thirty years.

The close of the war was naturally followed by a period of readjustment, involving semi-stagnation in the production of such metals as nickel, copper, lead and zinc, as well as in other minerals. The year 1920 showed a quick reaction to increased output, particularly of non-metallics and structural products, resulting in a total value of production greater than that of any previous year. This high level was not maintained, and a further depression in metal output, especially copper and nickel, with lower prices for silver, reduced the total value for 1921 to a figure below that of any of the previous five years. Good, silver and lead outputs advanced decidedly during the past year and, while copper and nickel remained low, the mineral production for 1922 reached a total value surpassed only in two or three exceptional years. The details for the principal items in the output for 1922 indicate the diversity of Canada's mining development.

The value of the mining industry to the Dominion is reflected only in a very general manner by the monetary sum of the total output, or by the variety of mineral products. Perhaps the best indication of its im

Annual Value of Mineral Production

Year	Metallic	Fuel and other non-metallics	Clay products and other structural materials, cement, lime, stone, etc.	Total
1890	$ 3,610,000	$ 9,140,000	$ 3,760,000	[illegible]*
1900	40,520,000	17,230,000	6,370,000	[illegible]
1910	49,440,000	37,760,000	19,630,000	[illegible]
1914	59,390,000	43,470,000	26,010,000	128,860,000
1918	114,550,000	77,620,000	19,130,000	211,300,000
1919	73,260,000	76,000,000	27,420,000	[illegible]
1920	77,940,000	108,030,000	41,890,000	[illegible]
1921	49,340,000	87,840,000	34,740,000	[illegible]
1922	61,150,000	83,180,000	39,300,000	[illegible]‡

* Includes $250,000 credited to products not reported.
† Includes $300,000 credited to products not reported.
‡ Preliminary estimate [illegible] Bureau of Statistics, Feb. 27, 1923

Principal Items of Mineral Production, 1922*

Product	Quantity	Value	per cent. of total
Metallic—			
Gold .. .. Fine ozs.	1,230,985	$ 25,446,717	13.86
Silver .. .. "	17,611,646	11,891,560	6.47
Lead .. .. lbs.	94,170,469	6,789,690	3.70
Nickel .. .. "	17,496,490	6,123,771	3.33
Copper .. .. "	43,321,403	5,797,270	3.16
Zinc .. .. "	56,397,500	3,223,681	1.76
Others	.....	1,872,301	1.02
Total value of metallics .	.....	61,144,990	33.30
Non-metallic—			
Coal .. .. tons	15,045,286	66,486,025	36.[illegible]
Natural gas .. M cu. ft.	14,954,097	5,468,963	2.98
Asbestos .. .. tons	158,198	5,264,650	2.87
Gypsum .. .. "	441,159	2,043,145	1.11
Salt .. .. "	177,193	1,646,666	0.90
Others	.....	2,273,434	1.24
Total value of non-metallics	.....	83,182,883	[illegible]
Structural materials, etc.—			
Cement .. .. bbls.	6,943,968	15,438,467	[illegible]
Clay products	.....	10,453,865	[illegible]
Lime .. .. bush.	8,065,304	3,178,115	[illegible]
Stone .. .. tons.	4,236,637	7,607,495	4.[illegible]
Sand and gravel .. .. "	11,574,862	2,624,324	[illegible]
Total value of structural materials etc.	.....	39,302,266	21.[illegible]
Grand Total	.....	183,630,139	100.00

* Preliminary estimate, Dominion Bureau of Statistics.

portance as a national asset and as a source of economic strength is furnished by the fact that the mining industry is credited with over 35 per cent of the total tonnage carried by Canadian railways. It is significant to note also that, as a result of the wide distribution of mineral resources, five of the nine provinces of the Dominion share substantially in mining activity, although Ontario leads her sister provinces by a considerable margin.

Mineral Production by Provinces, 1922

Province	Value of production	Per cent of total
Nova Scotia	$ 28,804,474	15.69
New Brunswick	2,414,152	1.31
Quebec	17,400,232	9.48
Ontario	65,370,366	35.60
Manitoba	2,118,529	1.15
Saskatchewan	827,645	0.45
Alberta	25,717,572	14.00
British Columbia	39,166,614	21.33
Yukon	1,810,555	0.99
Total	183,630,139	100.0

Distribution of Minerals

Eastern Canada.—Important deposits of coal, iron, gold and gypsum are mined or quarried in the Atlantic coast province of Nova Scotia. There is a considerable production of clay products, limestone for furnace flux, and sandstone for building purposes and for grindstones. Granite and manganese, antimony, tripolite, barite and salt are also mined, while some attention has been paid to copper and lead ores.

The most important mining development in Nova Scotia is in coal, and upon this based the large iron and steel industries of Sydney and New Glasgow. The iron ores are brought from the Wabana mines in Newfoundland. The close association here of one of the largest iron ore deposits in the world with enormous coal resources and necessary fluxes, all conveniently situated on the Atlantic seaboard, may well become in future a controlling factor in a large portion of the world's iron and steel trade.

Mineral Production of Nova Scotia, 1920

	Quantity	Value $
Coal, tons	6,429,291	32,238,129
Gypsum, tons	260,661	573,752
Clay products	.....	541,114
Stone	.....	420,175
Other products	.....	356,847
Total	.....	34,130,017

* To illustrate the diversity of mineral output in the various provinces the statistics for 1920 are used in preference to those for 1921, as the latter cover a period of depression in certain branches of the mining industry .

Mineral development in New Brunswick is less prominent. This is partly due to the covering of soil and to the forested areas which make prospecting difficult. The principal mineral products are iron, gypsum, natural gas, lime, coal, building material, grindstones, clays and mineral water. Antimony, manganese and albertite have been important, while copper, lead, silver, nickel, gold and other minerals have been found. Shales rich in oils and ammonium salts occur in large quantity.

Ontario and Quebec.—The main asbestos mines of the world are found in the southeastern portion of Quebec, and other important industries are carried on in chrome iron ore, copper, pyrites and the quarrying of granite. Iron ores and gold also occur.

Mineral Production of Quebec, 1920

	Quantity	Value $
Asbestos and asbestic .. .. .. tons.	199,573	[illegible]
Cement .. .. brls.	3,013,463	[illegible]
Clay products	.....	[illegible]
Stone	.....	[illegible]
Lime .. .. bush.	[illegible]	[illegible]
Magnesite .. .. tons	[illegible]	[illegible]
Mica	.....	[illegible]
Other products	.....	[illegible]
Total	.....	28,886,214

Within the past year prospecting for gold has been very active in Rouyn township and adjoining area in Timiskaming county, northwestern Quebec. Important discoveries have been made and their encouraging nature has led to the staking of many thousands of acres of mining land. The geology of the area is somewhat similar to that of the well known Kirkland Lake district.

The southern portion of Ontario and the valley of the St. Lawrence, designated as the St. Lawrence Lowlands, are covered mainly by flat lying Paleozoic rocks. The mineral products include clay, cement, slate, lime, limestone and sandstone, petroleum, natural gas, salt, gypsum and other non-metallic products.

Mineral Wealth of Huge Laurentian Plateau

The country extending from Labrador on the east, enclosing the Hudson Bay basin, and referred to as the Laurentian Plateau region, consists of a huge U-shaped area of pre-Cambrian rocks, estimated to cover 2,000,000 square miles, or over one-half of Canada. This region occupies nearly all but the most southern portions of the provinces of Quebec, Ontario and Manitoba.

The rocks of the pre-Cambrian are remarkable for the variety of their useful and valuable mineral deposits. Iron, copper, nickel, cobalt, silver, gold, plati-

num and palladium, molybdenum, lead, zinc, arsenic, pyrites, mica, apatite, graphite, feldspar, fluorspar, quartz, talc, actinolite, the rare earths, ornamental stones and gems, building materials, etc., are all found, and are, or have been, profitably mined. Most of the other materials — both common and rare — that are used in the arts, have been found.

Mineral Production of Ontario, 1920

	Quantity	Value
Nickel .. .. lbs.	61,335,706	$24,534,282
Gold .. .. ozs.	564,995	11,679,483
Silver .. .. "	9,907,626	9,996,795
Clay Products	.....	5,613,485
Copper .. .. lbs.	32,059,993	5,596,392
Cement .. .. brls.	2,035,594	4,377,814
Stone	.....	4,035,478
Natural gas .. .. .. M cu. ft.	10,529,374	2,920,731
Iron, pig, from Canadian ore .. .. tons.	75,869	2,066,997
Lime .. .. bush.	5,109,635	1,962,086
Salt .. .. tons.	206,832	1,512,724
Cobalt, metallic, and in oxide, etc. .. .. lbs.	546,023	1,365,058
Petroleum .. .. brls.	180,071	726,286
Pyrites .. .. tons.	148,652	618,283
Other products	.....	4,709,911
Total	.....	$81,715,808

The mineral output of the province of Ontario is unusually diversified. Along the southern edge of the Laurentian Plateau region in Canada there are the known gold ranges of the Lake of the Woods, the silver of Thunder Bay, a succession of iron ranges extending from Minnesota for hundreds of miles to Quebec, copper rocks of Michipicoten and Bruce mines; the Sudbury copper-nickel deposits; the Montreal River and Cobalt silver areas; the Porcupine, Larder Lake and Kirkland Lake gold fields; the corundum deposits of eastern Ontario; the magnetites of eastern Ontario and Quebec, and their large apatite-mica deposits.

In recent years the outstanding feature of the Ontario mineral industry has been the rapid increase in gold production. Gold mining in Ontario has extended over half a century but has made its chief progress since 1911, owing particularly to the Porcupine and, to a less extent, to the Kirkland Lake areas. The output for 1922 reached approximately one million ounces, valued in excess of $20,000,000. There is ample

Gold Production of Northern Ontario, 1918-1922

1918	$ 8,502,480
1919	$10,451,709
1920	$11,686,043
1921	$14,624,085
1922	$20,668,692

evidence that Ontario's gold production will probably double in the next few years and, added to the production of silver, nickel, copper and numerous other minerals which have been mined extensively for many years, will give the province a very high rank among the world's principal mineral producing areas.

Manitoba and Saskatchewan. The western end of the pre-Cambrian region extends across the northern portion of Manitoba and Saskatchewan. Prospecting in these provinces has already been rewarded by important discoveries. Numerous claims have been staked for gold, and several mines are under development, but the most important discoveries have been the copper-zinc sulphide deposits at Flin-Flon lake and Schist lake. The Mandy mine at Schist lake has already shipped a considerable tonnage of high grade copper ore, and the Flin-Flon property has been extensively drilled, proving an ore body of about 16,000,000 tons. With transportation and smelting facilities provided, a large mineral area may be actively developed, but as yet Manitoba and Saskatchewan do not possess extensive mining activity.

It is a safe assumption that this great northern area, still almost entirely unexplored and but slightly prospected, contains vast stores of mineral wealth which will become available as the country is opened up.

The Interior Continental Plain. This area includes the greater portions of Manitoba and Saskatchewan which lie outside of the pre-Cambrian, and the province of Alberta. It is pre-eminently agricultural, but in addition to furnishing an important market for the product of the mine, will have a large output of non-metallic minerals. It is underlain for the greater part by sedimentary rocks, chiefly of Cretaceous age, containing coal, building stones, clays and cement materials. The lignite of the more easterly plains, useful for local purposes, becomes more highly bituminous as the mountains are approached. The known coal reserves in Alberta are greater than in any other province, being estimated at 1,072,627 millions of metric tons. Natural gas occurs over wide areas, and there is every indication of the existence of oil fields. Intensive prospecting for oil is now being carried on by large Canadian and British corporations. Enormous deposits of tar sands have been found in northern Alberta, gold in a number of the rivers coming from the mountains, and clay ironstone occurrences in many parts of the Northwest.

Mineral Production of Alberta, 1920

	Quantity	Value
		$
Coal .. .. tons.	6,833,500	29,849,608
Natural gas .. .. M cu. ft.	5,633,442	1,181,341
Clay products	.. ..	[illegible]
Petroleum .. .. brls.	11,032	75,986
Other products	.. ..	[illegible]
Total	.....	[illegible]

Coal has been the principal product in Alberta and Saskatchewan, and natural gas has been extensively used for many years in the former province. Gypsum has long been quarried in Manitoba, and salt was also formerly recovered from brines. Drilling for salt is now in progress in Alberta. Natural deposits of sodium sulphate in Saskatchewan and Alberta are attracting considerable attention, and a beginning has been made in marketing the product. The white clays of southern Saskatchewan are being used for the manufacture of more or less refractory products, and will eventually be the basis of large ceramic industries.

British Columbia and the Yukon. The Cordilleran belt in South America, in Mexico and in the Western States, is recognized as one of the greatest mining regions of the world, noted principally for its wealth in gold, silver, copper and lead.

In Canada this belt has a length of 1,300 miles, a width of 400 miles, and its rocks range from the oldest formations to the youngest. It is not only rich in gold, silver, copper, lead and zinc, but has enormous resources of coal of excellent quality, varying from lignites to anthracite. Though mostly unprospected, it has already been proved to possess immense coal fields, several of the greatest copper and silver-lead mines, one of the greatest zinc mines, and two of the greatest placer camps in western America.

The coal fields of the Crowsnest Pass district, and the coking ovens at Fernie and Michel, have supplied fuel for the smelting industries of southern British

Columbia and of the adjacent states to the south. The Vancouver Island coal mines have supplied metallurgical fuel and domestic and steam coal for home consumption and for export.

Mineral Production of British Columbia in 1920

	Quantity	Value
Coal ..tons.	2,858,877	16,726,950
Copper lbs.	45,319,771	7,911,019
Silver ozs.	3,327,028	3,356,971
Zinc lbs.	38,729,762	2,970,960
Lead "	32,792,725	2,931,670
Gold ozs.	124,808	2,580,010
Clay Products	.....	596,172
Other products	.....	2,337,976
Total	.....	39,411,728

Metal Mining in British Columbia

The metalliferous ores of British Columbia are highly complex. Hitherto the production of silver-lead-zinc ores has predominated in the Kootenay districts, gold-copper ores at Rossland, low-grade copper ores in the "Boundary district", and copper ores on the coast. In the Sullivan mine at Kimberley upwards of 6,000,000 tons of lead and zinc ore are claimed to have been developed, from which a large tonnage is shipped annually. At Trail a series of smelting and refining plants produce refined gold and silver, electrolytic lead, copper and zinc. The Rossland camp has had a varied history. Its ores are primarily gold ores, supplemented by a small copper content. Recent improvements in ore concentration methods and extensive ore development seem to ensure many years of further successful operation. At the Copper Mountain properties, near Princeton, a large mill has been erected, the concentrates being sent to Trail for smelting.

On the coast enormous bodies of copper ores have been developed at Britannia Bay and at Anyox. At the latter point a large smelting plant, in operation since 1914, is now producing upwards of 30,000,000 pounds of copper per annum. A complete by-product coking plant has been erected, the operating company having acquired its own coal areas on Vancouver Island. The new 2,500-ton mill at the Britannia Mine is treating 2,300 tons per day and will also produce at the rate of about 30,000,000 pounds of copper per year in the form of copper concentrates. Various properties on the coast give promise of large silver and gold production, while iron ores have been found at different points on the coast and in the interior. The Salmon River-Portland Canal area has gained world wide fame following the success of the Premier gold-silver mine, which has paid dividends of $3,650,000 up to April, 1923, after about three years' operations.

The Yukon district has held attention in the past chiefly because of its rich gold placers. Copper, silver and lead ores have been mined, however, and many other metals have been found. Coal has been found both in the southern and northern areas. At present attention is being centred on phenomenally rich silver-lead ores near Mayo.

The Northwest Territories are believed to possess great latent mineral resources. Those to which attention has already been directed include the native copper of the Coppermine River country, the iron ores of Belcher Island, gold and zinc near Great Slave lake and petroleum in the Mackenzie River basin below Fort Norman.

External Trade in Mineral Products

A very large portion of the mineral production of Canada is exported for consumption or refining outside of Canada. On the other hand, considerable quantities of mine products are imported, chiefly those which have been refined or subjected to partial treatment, or in the form of manufactured goods ready for consumption. For economic or geographic reasons Canada is also a heavy importer of coal and iron. Sufficient domestic resources of petroleum have not yet been developed, and tin is obtained entirely from abroad.

The total values of exports and imports of mineral products, crude or refined, and of manufactured mine products is shown for a number of years in the Table below. As these figures include manufactured goods they are not comparable to the mineral production records.

External Trade in Mineral Products, Crude and Refined, and Manufactured Mine Products, 1913-1921.

Calender year	Exports of Canadian Merchandise	Imports for consumption	Excess of imports over exports
	$		$
1913	79,804,000	259,300,000	179,496,000
1914	75,533,000	181,676,000	106,143,000
1915	124,158,000	146,465,000	22,307,000
1916	178,575,000	256,347,000	77,772,000
1917	187,894,000	355,928,000	168,034,000
1918	180,083,000	347,682,000	167,599,000
1919	179,958,000	330,711,000	150,753,000
1920	193,420,000	496,380,000	302,960,000
1921	92,357,000	303,522,000	211,165,000
Total, 1913-1921	1,291,782,000	2,678,011,000	1,386,229,000
Annual aver., 1913-1921	143,531,000	297,556,000	154,025,000

It will be observed that Canada figures much more prominently in foreign markets as a buyer than as a seller of commodities of mineral origin. On the interchange of such products the Dominion normally incurs a heavy adverse balance. Her mineral resources and industries support a large volume of export sales but several factors have combined to build up a much greater volume of purchases.

Mineral Imports

Canada's mineral purchases from abroad annually include a wide variety of products but the aggregate value is accounted for largely by three items — iron and steel goods, coal and petroleum. It is significant to note that, of the total mineral imports during 1920, amounting to over $482,000,000, about $250,000,000, or more than half, was contributed by iron and steel products, and over $151,000,000, or approximately 31 per cent, by coal, coke and petroleum.

The size of Canada's annual bill for mineral imports does not merely reflect the fact that native resources of coal, iron ore and petroleum have for one reason or another fallen short of meeting domestic needs. There is the further fact that a large portion of the imports is taken in the form of highly manufactured products, such as machinery, implements and automobiles. Thus the monetary sum of the Dominion's mineral purchases is perhaps due less to limitations in basic mineral resources and industries than to the necessarily moderate size of [illegible] settled country can strengthen its facilities for specialized manufacture.

Mineral Exports

Of the total exports in 1920 about $60,000,000 can be attributed to metals, either in crude or refined metallic form or contained in ores or some form of metallurgical product exported for further refining

These include pig iron, ferro-alloys, steel billets and ingots, aluminium, cobalt, copper, lead, nickel, zinc, and gold and silver. About $38,000,000 is attributed to asbestos, coal, mica, and various other non-metallic minerals, and approximately $12,000,000 represents chemical products, such as cyanamide, calcium carbide, ammonium sulphate, etc. The balance of over $83,000,000 is made up largely of manufactured products, chiefly manufactures of iron and steel, such as agricultural implements, machinery, boilers and locomotives, automobiles, steel rolling mill products, and wire.

Future Development

The future development of mineral industries will undoubtedly go hand in hand with the growth of population, the advance of settlement and the extension of transportation facilities. Their rate of progress promises to surpass that of the past quarter of a century. During that period both the metallurgical and chemical industries made great strides, but it was also true that mineral resources in Canada were forced to face severe competition. They had to offer exceptional promise in order to attract any great share of development funds and enterprise. Very strong inducements were being held out in other directions—by agricultural lands, pulpwood areas and waterpowers, which have yielded good returns with relative freedom from the element of risk.

There is now every evidence that Canada has already entered upon a new period of development and that, in future, mineral resources will receive and generously reward a much greater share of attention than they formerly enjoyed. Such a course of industrial growth will be strictly in accord with the economic needs of the Dominion and with the unanimous belief in the nature and wealth of its hidden physical resources.

Letters From Readers

The Rochester Property

To the Editor,
Canadian Mining Journal,

In your News and Comments (issue of November 16th there is an article headed "Canadel, oh Canadel" by Alexander Gray.

This has been answered in part by Mr. Frank Loring, who deals fully with the organization of the different companies and their objects. There are, however, several statements made by Mr. Gray which should be corrected.

In the first place, the Rochester is not a Veteran claim, as it was a tract of some 185 acres staked shortly after the Hollinger.

Secondly, the statement as to the price is not correct and should be $275,000. This Mr. Gray could have ascertained had he taken the trouble to consult the writer.

I have just returned from an examination of the property and the work done since its purchase reflects great credit on those in charge.

The veins discovered in the drift at the 100-foot level and those tapped by the shaft now at a depth of 900 feet give it all the earmarks of a producer in the near future, and we are in no way exercised as to future payments, as these veins would more than warrant the company exercising their option.

Ottawa, Ont. D. B. Rochester.

The experimental use of liquid oxygen in Colorad has shown it to cost about half as much as dynamite

PERSONAL AND GENERAL

Mr. D. G. Sinclair has been appointed assistant in spector of mines for the Province of Ontario with headquarters for the present at Sudbury. Mr. Sin clair graduated from the University of Toronto in min ing engineering in 1913 and was attached to the en gineering staff of the International Nickel Company of Canada, later becoming chief surveyor at the Creigh ton Mine. Following this he was made shift boss a the Creighton Mine, which position he held for five years previous to being appointed inspector of mines

Dr. W. L. Goodwin is holding the first prospectors class for this season at Coniston. His winter tour o behalf of the Ontario Department of Mines will tak him later to the other centres of mining activity i the province, [illegible] the majority of th prospectors gather for the winter months.

Mr. D. H. MacDougall paid a professional visit t Cobalt recently.

Mr. Cyril W. Knight, geologist of Nipissing Min spent three weeks in the Rouyn-Boischatel gold regi of northwestern Quebec, studying the geology of th area, before the freeze-up made further field wor impracticable.

THE MOTION PICTURE AS AN AID TO RESEARCH

Professor H. E. T. Haultain's recent lecture tour the United States has stimulated the following editor al comment in [illegible]

Theoretical details of many mechanical operation that constitute the essential phases of chemical eng neering processes have long remained matters f conjecture and dispute. This is particularly true regard to the operation and motion of grinding me in mills that are inclosed, making visual obser at difficult or impossible. Furthermore, the human ey although able to register the picture of an insta taneous action, is incapable of following the many ste that make up that action, or of grasping fully t changes that occur in minute intervals of time. such event the motion picture camera may be used register each successive movement, the timing of p jection being arranged according to the effect desir

In this connection it is interesting to note the markable work being done by Prof. H. E. T. Hault and associates at Toronto University, the results whose researches to date, crystallized in the form of series of motion pictures, provide ample food f thought. Slow-motion projection of photographs of glass-sided cylindrical mill in action show that commonly accepted mathematical conception of t operation is at fault—that the balls travel up the s of the mill at a uniform rate of speed, then make parabolic descent to the liner at the bottom, leaving space between the paths of elevation and fall. At n mal rates of speed the motion picture shows that the balls are in contact with one another in every p of the charge; no space exists between the rising umn and the falling column. In fact, near the of the mass there appears to be an inactive zone, wh little movement of the media is observable. It is al interesting to note that a distinct segregation of t smaller balls occurs in this central zone. This although inexplicable, aids in the efficient operat of the mill. Outside the inactive zone the rubbing ball on ball is apparent, emphasizing the logic of st

ing abrasive grinding as the dominant action in the mill.

Since the tube mill was borrowed from the cement industry in 1895 for the grinding of sulphotelluride gold ore it has undergone only minor modifications in design, but the necessity for operating wet has deflected attention to many efficiency factors and suggested experimentation and research; these include ball load, speed of mill in relation to diameter, moisture content and volume of pulp. Most of the problems involved have been solved satisfactorily, and it is believed that the experiments now being made at Toronto University will throw fresh light on the subject of the scope of such a machine for the pulverization of a great variety of mineral and chemical products.

RECORD COAL OUTPUT IN ALBERTA EXPECTED

The year 1923 will see a new record in Alberta coal production. It is expected the total production for the year will reach 7,000,000 tons, in comparison with less than 6,000,000 last year. The production up to November 1, is 1,500,000 tons greater than the production of the same period last year. The record production previously was in 1920, when 6,400,000 tons was produced. The payroll this year, it is expected, will be over $18,000,000.

SUCCESSFUL CARBONIZATION PLANT

It is reported in *Chemistry and Industry* that the "Coalite" plant of Low Temperature Carbonization, Ltd., near Barnsley, England, is a complete success. It has been in operation on a commercial basis since 1921, and its success is such that a 500-ton plant is to be erected there, and similar plants in various parts of the country. The raw coal is carbonized at a temperature of 1,000 deg. F. The products from a ton of average coal are 1,400 lbs. of "coalite", a superior, smokeless fuel; 4,500 to 6,000 cubic feet of gas (700 to 825 B.t.u.); 18 to 20 gal. of low-temperature oils; and 15 lb. sulphate of ammonia.

AIR DRILLS MAKE RECORD AT SHAWINIGAN FALLS

In carrying out their operations at Shawinigan Falls, Que., the Grenville Crushed Rock Company has to deal with rock consisting of soft and hard layers of granite full of slips and with products of white quartz scattered throughout. The layers of granite vary greatly in hardness, sometimes cutting freely for four or five feet and then running hard from four to six feet. These facts are mentioned in order that the following figures may be duly gauged.

The company has on this job three Leyner-Ingersoll X-70 rock drills, and since the first of these tools was employed the management has kept a record of their performances. The results are decidedly suggestive, and show what can be done under unfavourable circumstances. During the month of July last, an exact record of the footage drill and time consumed was kept for each drill. All the machines were fitted with standard 1¼-inch, hollow, round steels, with "Leyner" shanks. The starter bits were of 2⅞-inch diameter, and ⅛-inch changes on 24-inch runs were used. The depth of holes were drilled to a depth of 28 feet. The air pressure employed ranged from 80 to 85 pounds. The thing that must be borne in mind is that the character of the ground made drilling at times extremely difficult because the rock prevented the rotation of the steels; and two of the drills had to contend with material on this sort for considerable periods. Work was carried on in 8-hour shifts.

Drilling Record

Date	Drill No. 1	Drill No. 2	Drill No. 3.
July 1	83 ft.		
2	75		
3	62		
4	72		
5	62		
6	76		
7	76	54 ft.	
8	67	65	
9	80	64	
10	76	75	12 ft.
11	64	74	52
12	82	76	96
13	92	105	103
14	78	86	104
16	75	74	89
17	98	84	110
18	87	74	64
19	78	66	96
20	79	53	103
21	74	70	70
23	88	75	104
24	80	85	111
26	43	60	83
28	80	65	85
29	70	55	
30	49	45	52
31	60	55	52
	2,008	1,460	1,386
Average per hour	9.3 ft.	8.7	10.2 ft.

General average 9.4 ft.

Considering frequent delays caused by bad ground, etc., the foregoing record is remarkable. There were no breakages of any sort; and on six different days drill No. 3 drilled more than 100 feet.

MAP OF CHU CHUA

The Geological Survey, Ottawa, has published a topographic map on a scale of a mile to the inch, with 100-foot contour intervals, of the Chu Chua map area in the North Thompson Valley, B.C. The recent development of coal seams in this area and the success that has attended the development of the Windpass property make the new map of direct commercial interest.

SOUTH AFRICAN ASBESTOS MINING DEPRESSED

Reports from South Africa indicate that the disorganized state of industry in Europe, and particularly in Germany, is having a decidedly adverse effect on asbestos mining, which is in a depressed state, with abnormally low prices quoted.

LUCKY JIM MINE TO REOPEN

It is reported that A. Larson and associates have bought the Lucky Jim Mine at Zincton, near Nelson, B.C., and that they will proceed to develop and work it immediately.

METAL MARKETS

Prices in carload lots, f.o.b. Montreal, as quoted by Consolidated M. & S. Co.)

Average for week ending December 11

Electrolytic copper	15.00
Zinc	7.85
Lead	7.875

THE MINING DISTRICTS

By THE JOURNAL'S CORRESPONDENTS

QUEBEC

Assay Office for Gold-Field.—The Quebec government has taken measures to provide a public assay office for the use of those working in the gold belt. J. T. Donald & Co. of Montreal have undertaken to place an assayer at Angliers, the end of steel on the Quinze river. A winter road is being cut from there northward, which it is expected will provide the easiest and most economical route to the gold area. With the opening of navigation next spring it is intended to run small steamers regularly on the water route northward from Angliers, one from the end of steel to the 1,000-foot portage at the foot of Barrière Lake, and the other through Barrière lake, Lonely river and Lake Opasatika to the north end of the last, where it touches the gold belt near Lake Fortune. This is a first-class water route, and will allow of a regular and inexpensive transportation service. It is, therefore, a logical decision to place an assay office at Angliers, which will be the principal "jumping-off place." The provincial government has undertaken to make good to Messrs. Donald & Co., any deficit they may incur while establishing their laboratory. There is a possibility that, if there is sufficient demand, a general testing laboratory may be developed, in addition to the assaying laboratory that constitutes the first item on the programme.

NORTHERN ONTARIO

South Lorrain. — The Mining Corporation is meeting with particularly favorable results in its development at the Frontier mine in South Lorrain. The main shaft was completed to the 6th level only a short time ago, and crosscutting started from the 5th and 6th levels. On the 5th level, within about 50 feet of the shaft, the Watson vein was encountered, where it showed an average of about 11 inches of 5,000-ounce ore. While the Watson vein is an extremely important one, the company expects that even better results will be met with in the development of the Woods vein at depth, as this is the most important ore-bearing fissure in the South Lorrain district. It is probable that the Woods vein will be encountered on both the 5th and 6th levels some time during December.

Shareholders in the Wettlaufer Silver Mines are being circularized for their proxies by J. F. H. Ussher, a mining broker of Toronto. Proxies are being requested with the idea of calling a meeting of the shareholders for the purpose of electing a new board of directors, who would show more interest in the property. Hopes are held out that the property may again become a producer, and Mr. Ussher promises, if successful, to have the mine unwatered and a thorough examination made by competent engineers.

Cobalt. — The Nipissing has declared the regular quarterly dividend of 3 per cent, with bonus of 3 per cent, payable January 21st to shareholders of record December 31st. Developments at this property have been very favorable, and, as a matter of fact, the company is producing high-grade concentrate faster than the plant and refinery are able to treat it. At present there is over 100 tons of concentrate that has been stored awaiting treatment. The company is in an extremely strong position, their net current assets amounting to approximately $4,700,000.

Anglo Canadian Explorers, which is an organization controlled by John Taylor & Sons, of London, has taken an option on a group of claims in the Gillies Limit, adjoining those held by the Mining Corporation. It is not expected that the company will do much work at present, as it is considered advisable to see what results are obtained by the Mining Corporation before going to any great expense. This same company has an option on the Kirkland Townsite property, on which diamond-drilling is being done. Favorable results have been encountered in the drilling, and a contract has been let to sink a shaft to a depth of 400 feet to confirm the drilling results by underground development.

Larder. — The Associated Goldfields in Larder Lake will continue the shaft on the Pancake Lake property from 750 feet to the 1,000-foot level, and will open up two new levels at 875 feet and 1,000 feet. Practically all the work to date has been done above the 500-foot level, and results have been similiar to those on the Crown Reserve property adjoining. It is to be hoped that some day these two properties, which are on the same veins, will be amalgamated. One mill could easily handle the ore from both properties and many economies could be effected by their being worked together. While the claim owned by the Associated Goldfields appears to be a valuable one, it is not big enough to support the capital of $30,000,000, which the Associated Goldfields has.

Kirkland. — During the month of October the Lake Shore treated 2,146 tons, and recovered $49,270, an average of $23.40 a ton. Work on the new mill has been severely handicapped by delayed delivery of materials and also by freight congestion, so that the company will probably not be able to increase its milling capacity until about next March.

Recent newspaper reports regarding the Montreal-Ontario seem to have official sanction for the statement that conditions at this property are very favorable. These reports, however, are not confirmed by men who are familiar with what is going on in Kirkland, who seem to have an entirely different opinion from that expressed in the press reports. The Montreal-Ontario has had an unfortunate history and it is greatly to be hoped that there will be no repetition of the fiasco which occurred when the mill was started. Either less publicity or else a complete statement regarding real conditions would be a good thing.

Porcupine. Underground work has been started on the Edwards property, which lies to the West of the West Dome Lake Mines. The incline shaft, which is down approximately 50 feet, will be continued to the 200-foot level. There is a promising surface exposure on which the shaft was sunk, which gave encouraging values, although they were hardly of sufficient grade to constitute payable ore. One big mining company

diamond-drilled the property a few years ago, but did not consider the results sufficiently encouraging to justify any extensive work. The development of the property is being financed by English interests.

The Vipond mill has started operations and it is expected to treat approximately 150 tons a day of $10.00 ore. This property, which is controlled by English interests, has staged a remarkable "comeback," the results of development work done during the current year having entirely altered the complexion of affairs. It is understood that developments underground continue to be favorable, and that there are for ore reserves several years already blocked out.

BRITISH COLUMBIA

Cedar Creek Litigation Settled. — The exploitation of rich placer leases on Cedar Creek, Cariboo, has been held up recently by litigation. The circumstances leading up to this were as follows: The "Big Six" mining syndicate, so called, made up of the original locators, sold to F. S. Munson of Seattle and associates for $180,000. The latter formed the Cedar Creek Mining Co. which proceeded to operate and took out, it is said, at least as much as the purchase price in gold values. On August 1st 1923, however, they were in default $60,000 owing to the "Big Six" and sixty-seven workmen had filed mechanics' liens against the property for $20,000 due in wages. Shortly prior to August 1st the Prudential Trust Co. of Vancouver were appointed receivers on behalf of all the creditors including the mechanic lien holders. Subsequent to that date notice of cancellation under the bond of the agreement was served by the "Big Six" and an attempt made to resume possession of the property. Confronted by the agent of the Prudential Trust Co. the representatives of the "Big Six" turned to the Courts for redress. Settlement, however, according to the announcement of A. S. Matthew, president of the Cedar Creek Mining Co., has been effected out of court, payment in full having been made to the first locators. Mr. Matthew is authority for the statement that nothing now stands in the way of the uninterrupted operation of the leases. Recent reports respecting the latter are bright. In breaking new ground high returns have been secured. Recovery is expensive because of scarcity of water, the ground being on the high levels; but the gold content, judging from authoritative reports, is such that a good profit is assured.

Stewart. — The Daly Alaska mineral claims, Portland Canal district, are to be further developed. Work is to proceed during the winter on a 500-foot tunnel, the object of which is to cut at depth the several veins outcropping on the property.

The property of the Indian Mines Ltd., Salmon River, is expected to pass definitely from the prospect stage to that of a shipping mine as a result of this winter's work. A raise in No. 1 Tunnel is reported to be up some 30 feet following a high-grade shoot of ore some three to four feet wide averaging about $100 in gold and silver values. This raise will be continued through to the surface, a distance of 280 feet, in order not only to extract the high-grade ore but to furnish ventilation for No. 1 and the lower tunnels. This raise is in Drift 15 and it is interesting to note that this and Drift 13 are in the same ore-body, the former following a high-grade gold shoot and the latter a high-grade silver shoot, the values of the latter being in sulphides. Diamond-drilling has proven the continuity of the body of ore in which these shoots occur. There is to be further diamond-drilling and tunneling during the next few months and the management is looking forward to being in shape to ship at least some high-grade ore with the opening of the 1924 season.

Smithers. — The Babine Bonanza property, near Smithers, has been closed down for the winter. James Cronin, the owner, states that this year's work has consisted of drifting on the main vein. At 200 feet a shoot of good ore has been opened up, thus removing all doubt as to the persistence of the ore at depth. Mr. Cronin contemplates the installation of a concentrator and other mine plant necessary to active mining operations. He has left to spend the winter in Spokane.

Usk. — S. A. Davis, with whom is associated a syndicate of business men of Seattle, is reported to have bonded the Lucky Luke Group of mineral claims situated close to the town of Usk on the National Railway, nothern British Columbia. This is not far from the Duthie properties, which have been taken over by the Guggenheims and which have been showing up extremely well. The Lucky Luke is said to be a first-class prospect, the ore being quartz mineralized with bornite and chalcopyrite and carrying from $30 to $37.50 in gold per ton in addition to its copper and silver values. It is a fissure vein from 1½ to 3 feet wide striking obliquely along the east slope of the Kitselas Mountain in a schisted zone in which also are found, to the north, the high-grade gold-copper veins of the Kitselas Mountain Copper Co. A winter road is to be constructed from the property to the railroad, a distance of a quarter of a mile, and a carload of ore is to be shipped as soon as the road is ready.

Peace River Coal.—J. D. Galloway, resident mining engineer at Hazelton, is visiting Victoria after an inspection tour of mining properties in the Peace River and the Cariboo districts. He speaks in the highest terms of the coal deposits of the Peace River, which he says are extensive and of very high grade, running in most cases 70 per cent. fixed carbon and 3 per cent. ash. Apart altogether from the grain and general agricultural possibilities of the district. Mr. Galloway thinks that its coal resources assure it a notable future.

Improved Coal Trade.—The coal trade of British Columbia has improved during the last two months. This is due chiefly to the growing domestic demand for fuel. It applies more to the collieries of the Coast than to those of the eastern section of the province. The mines of Vancouver Island had a good month in October. They are expected to have an equally satisfactory output for November. In the Nicola-Princeton field there has been considerable activity and it is reported that a new mine is to be opened up at an early date. News from the Crow's Nest Pass field, however, is not so bright. It is stated that the competition of fuel oil is making serious inroads into the business of the Crow's Nest Pass Coal Co. and the Corbin Coal & Coke Co. Much of the railway trade has been lost to these companies through the conversion of most of the locomotives into oil burners. At present, it is stated, the mines at Coal Creek have been working two and three days a week. Some domestic coke is being produced at Michel, which has been of

some help to that community. Generally, however, the business may be said to have a better tone than was the case four months ago and the provincial production for the year should compare favorably with that of last year.

Tax on Fuel Oil.—One of the outstanding events of the past week from the viewpoint of coal mine operators and employees was the announcement in the budget speech of the Hon. John Hart, Minister of Finance, to the Legislative Assembly of the Province that a tax of one-half a cent per gallon would be placed on foreign fuel oil consumed in British Columbia. This is a policy that has long been advocated by Hon. Wm. Sloan, Minister of Mines, who represents the coal mining town of Nanaimo, Vancouver Island, in the Legislature. He has taken advantage of every opportunity to dwell publicly on the effect of the constantly growing use of fuel oil for industrial and domestic purposes in the province on the local coal mining industry. He is given credit for having influenced the government to adopt this measure. It is hoped by the coal mining fraternity that its application will afford them some relief.

Strike at Collieries.—Employees of the Sterling and the Coal Valley Mines, near Coal Spur, Alberta, are on strike. Mine officials state that the dispute is not so much one of wages as their determination to keep their mines out of U. M. W. of A. control.

Success at Windpass Mine. — The discovery of high-grade gold-bearing ore at the Windpass Mine, Chu Chua, about sixty miles north of the city of Kamloops on the Canadian National Railway is pronounced by Mr A. W. Davis, the Government Mining Engineer, to be the most noteworthy event of the year in the central interior of British Columbia.

Some two years ago, this property was bonded by the late General R. G. Edwardes Leckie, with whom were associated Messrs. Trites, Wood and Wilson of Fernie, who, it will be recalled, met with their first outstanding mining success in the opening up of the Premier Mine, and the subsequent transfer of a majority interest in the mine to the Guggenheims. General Leckie carried on vigorous development for a year or more. Two shafts have been sunk and connected with an old adit level on the vein at a depth of 100 feet below surface. The tragedy of the story is that General Leckie died before it became known that his judgment and faith had been justified.

The removal of the prime mover in the enterprise did not alter the determination of his associates to see it through to a definite issue one way or the other. Now, as has been indicated, their perseverance has been rewarded. Within the last few months, the vein has been sufficiently developed to indicate that this prospect will likely become a mine.

The Windpass vein lies in a diorite sill; it is partly quartzose, but largely a replacement of wall rock by magnetite, chalcopyrite and pyrrhotite. Bismuth and a gold telluride occur. The ore probably is primary. At present preparations are being made for more extensive development.

MAPLE BAY ORE MOVING

The Maple Bay mine, Portland Canal, may possibly ship one or two cargoes of ore to the Granby smelter at Anyox; but it is not likely regular shipments will commence until the first of the year.

NOVA SCOTIA

Pension Fund Committee—Following the announcement of President Roy Wolvin of an old age pension scheme for the workmen of the corporation the following committee has been appointed to administer the fund: H. J. McCann, General Manager Besco coal, Chairman; W. H. Bischoff, General Superintendent of the Steel company, Vice-chairman; A. W. McDonald, Superintendent of Industrials Relations, Secretary; M. A. Doak, comptroller:—all of Sydney; Archie McColl, Manager, Nova Scotia Steel & Coal Co., New Glasgow and J. E. McLurg, Manager of the Shipyards, Halifax.

The first meeting was held for organization purposes. It is understood this committee will have large powers and may not at the beginning be restricted to the conditions stated by Mr. Wolvin when he first gave public notice of the pension scheme. After the first list has been prepared and accepted the work will automatically carry on; but at the beginning there will, no doubt, be cases requiring sound judgment and common sense on the part of the Committee. As the Committee represents the heads of the different departments and as each member has his own individual gifts and qualities for department administration, the pension fund will be in the hands of the strong men of the corporation.

Pensions will Benefit Company Also—The popularity of the scheme is general and both the workmen and the public are beginning to revise their opinions of the B. E. S. Corporation. There is little doubt that more faithful service will be given and there will be more loyalty, due to the benefits of this fund..

We are not, however, blind to the fact that the Corporation will profit materially by the adoption of the pension scheme. Indeed, ever since mining began in Nova Scotia (and it is no doubt true of most other employment) the older workers have been cared for. The different companies have found employment of some kind for the old men and these, up to a very recent period, were all kept at work. The Compensation Act with its startling statistics of accidents has led to searching investigations, which throw light on the whole subject of accidents, and it has been found that age has much to do with liability to accident. Still, there will be plenty of room among the younger men for those of the "old guard" who remain hale and hearty.

Nova Scotia at the Exhibition—The exhibit of the British Empire Steel Corporation for the British Empire Exhibition at Wembley Park, London, next year, was shipped to Ottawa recently. It took upwards of four months to assemble all the material and get ready the charts and plans showing the natural resources of this great Corporation, its plants, railways, piers, ships and minerals and their products.

The great variety of manufactured products, the raw materials such as iron ore, limestone, coal have all been artistically arranged and form a most striking display. Pig iron, steel billets, blooms and ingots, rails, wire rods, barbed and other kinds of wire, seventy different kinds of nails, silica brick, coke and by-products of coal, these are only part of the exhibit. A suspicious looking little box contains six vials labelled Road Oil, Tar Crude Naptholene, Sulphate of Ammonia, Motor Fuel Solvent Naphtha, C. P. Toluol and C. P. Benzol,—all by-products of coal.

The facilities of the Corporation for storing, handling and shipping material are represented by photographs. Views are seen of the Halifax Shipyards and

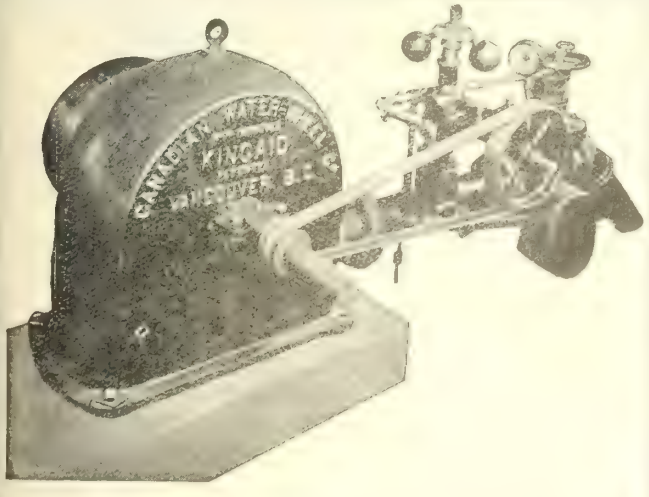
shipe built there, Halifax Dry Dock, Sydney Steel Plant with its shipping piers, loading and discharging, the shipping piers of North Sydney, Pictou and Parrsboro. There are maps of the coal areas of Cape Breton showing all collieries and coal seams, also maps of Newfoundland showing the iron ore properties and ore mining plants, as well as the limestone quarries at Port au Basque.

The extent of the Corporation's natural resources is indicated by the following figures:

	Reserve tons	Annual production tons
Coal	6,000,000,000	6,000,000
Iron Ore	6,900,000,000	1,200,000
Limestone	150,000,000	600,000
Silica	40,000,000	10,000

The annual capacity of the Sydney steel plant is 350,000 ingot-tons, and of the Sydney Mines plant, 144,000 ingot-tons.

Wage Negotiations in Progress—Negotiations on the new wage agreement opened last week when the Executive of the United Mine Workers met in the office of General Manager H. J. McCann. A statement was given out that no report of the proceedings would be made public until the agreement has been drawn up. The Corporation has notified the United Mine Workers of its desire to terminate the present agreement, and there is considerable anxiety among the workmen as to what is behind the action. Something must be done to train larger numbers of young men for work at the face, and the Corporation may have this problem in mind. The present agreement was made under the pressure of strike conditions and can be much improved, from the points of view both of the miners and the management.



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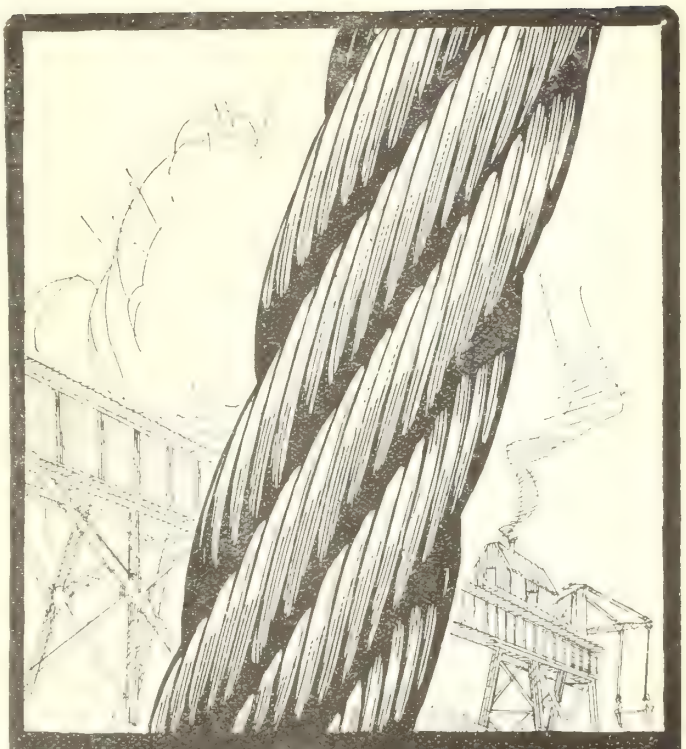

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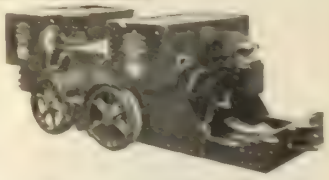

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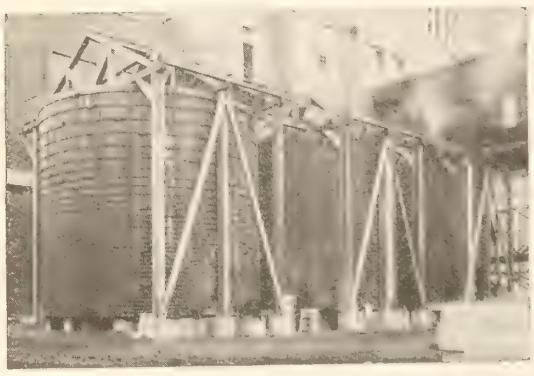

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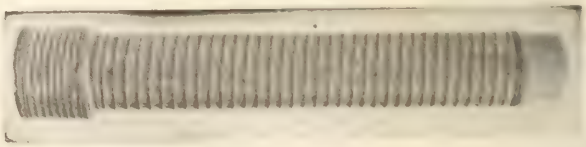

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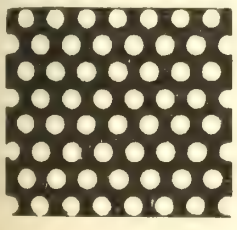

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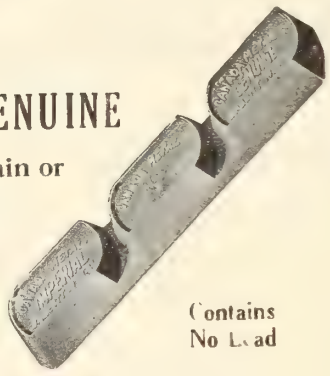

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Addresses of advertisers whose names appear in the following classified index, may be found upon reference to their advertisements. An alphabetical index to advertisers will be found on the page facing the inside back cover. The following regulations apply to all advertisers: — One-eighth page, every issue, three headings, one-quarter page, every issue, six headings; one-half page, every issue, twelve headings; full page, every issue, twenty-four headings. Buyers who are unable to find in the classification here given such machinery or supplies as they desire are invited to write Service Dept., Canadian Mining Journal, Gardenvale, Que., who can, in all probability, refer them to proper sources.

Acetylene Lamps:
Canadian Fairbanks-Morse Co., Ltd.
Dewar Manufacturing Co., Inc.

Agitators:
The Dorr Co.

Air Compressors:
Belliss & Morcom Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Canadian Fairbanks-Morse Co., Ltd
Denver Rock Drill Mfg. Co., Ltd.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Laurie & Lamb.
Sullivan Machinery.

Air Hoists:
Canadian Ingersoll-Rand Co. Ltd
Canadian Fairbanks-Morse Co., Ltd
Denver Rock Drill Mfg. Co.
Herbert, Alfred, Limited.
Holman Bros. Ltd.

Air Receivers:
Canadian Ingersoll-Rand Co., Ltd

Alloy & Carbon Tool Steel:
Hardy Patent Picks Co.
Peacock Bros. Ltd.
Sam'l Osborn (Canada) Ltd.

Amalgamators:
Mine & Smelter Supply Co

Ash Handling Machinery:
Link-Belt Limited.
Canadian Mead-Morrison Co.
Powley & Moody, Limited.

Assayers and Chemists:
Ledoux & Co.
Thos. Heyes & Son.

Assayer's and Chemists' Supplies:
Lymans, Limited.
Mine & Smelter Supply Co

Balances — Assay & Analytical:
Mine & Smelter Supply.

Balls:
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Hull Iron & Steel Foundries, Ltd
Peacock Brothers, Limited.
The William Kennedy & Sons, Ltd

Ball Mills:
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Hull Iron & Steel Foundries, Ltd
Mine & Smelter Supply.

Ball Mill Feeders:
Herbert, Alfred, Limited.
Holman Bros. Ltd.
Hull Iron & Smelter Supply.
Mine & Smelter Supply.

Ball Mill Linings:
Canadian Steel Foundries, Ltd
The William Kennedy & Sons, Ltd
Hardy Patent Picks Co.
Sam'l Osborn (Canada) Ltd.
Peacock Bros., Ltd.
Hull Iron & Steel Foundries, Ltd
Mine & Smelter Supply.

Bearings:
Canadian Fairbanks-Morse Co., Ltd
Dodge Manufacturing Co.

Belt Clamps:
Dodge Manufacturing Co

Belt Conveyers:
Dodge Manufacturing Co

Belting — Leather, Rubber & Cotton:
Link-Belt Limited
Jones & Glassco (Regd.)

Belting:
Canadian Fairbanks-Morse Co., Ltd
Gutta Percha & Rubber, Ltd.

Belting (Conveyor):
Canadian Fairbanks-Morse Co., Ltd
Gutta Percha & Rubber Ltd
Dodge Manufacturing Co
Dunlop Tire & Rubber Co., Ltd

Belting — Silent Chain:
Link-Belt Limited
Hans Renold of Canada, Ltd.
Jones & Glassco (Regd.).

Bins & Hoppers:
Hendrick Manufacturing Co.
The William Kennedy & Sons, Ltd

Bluestone:
The Consol'd Mining & Smelting Co

Boilers:
The William Kennedy & Sons, Ltd

Boxes, Cable Junction:
Dodge Manufacturing Co.
Standard Underground Cable Co. of Canada, Ltd.
Northern Electric Co., Ltd

Brackets:
Dodge Manufacturing Co

Brazilian Ballas:
Diamond Drill Carbon Co

Bronze, Manganese, Perforated & Plat
Hendrick Manufacturing Co

Buckets:
Canadian Ingersoll-Rand Co., Ltd
Canadian Fairbanks-Morse Co., Ltd
Dodge Manufacturing Co
Hadfields, Limited
Hendrick Manufacturing Co
Herbert, Alfred, Limited
Holman Bros., Ltd.
Link-Belt Limited
The William Kennedy & Sons, Ltd
Peacock Bros., Ltd

Bucket Lips:
Canadian Steel Foundries, Ltd
The William Kennedy & Sons Ltd

Buggies, Mine Car (Steel):
Hendrick Manufacturing Co
Herbert, Alfred, Limited
Holman Bros., Ltd.
Powley & Moody, Limited

Bushings:
Dodge Manufacturing Co

Cable — Aerial and Underground:
Canada Wire & Cable Co
Standard Underground Cable Co of Canada, Ltd
Peacock Brothers, Limited

Cables — Wire:
Standard Underground Cable Co. of Canada Ltd.
Canada Wire & Cable Co.
Peacock Bros. Ltd.

Cable Railway Systems:
Canada Wire & Cable Co

Cages:
Canadian Ingersoll-Rand Co. Ltd.
The Mine & Smelter Supply Co.
Herbert, Alfred, Limited.
Holman, Ltd.
The William Kennedy & Sons, Ltd.

Cam Shafts:
Canada Foundries & Forgings, Ltd.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Hull Iron & Steel Foundries, Ltd
Powley & Moody, Limited.
Peacock Brothers, Ltd.

Cars:
Canadian Mead-Morrison Co
Herbert, Alfred, Limited.
Holman Bros., Ltd.
John J. Gartshore.
Peacock Brothers, Limited.
Powley & Moody, Limited.
The William Kennedy & Sons, Ltd.

Car Dump:
Canadian Mead-Morrison Co
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Powley & Moody, Limited.
Sullivan Machinery Co.

Cars—Hand:
Sylvester Mfg. Co., Ltd.

Cars—Mine:
William Kennedy & Sons Ltd.

Car Pullers:
Canadian Mead-Morrison Co.

Carries (Gravity):
Jones & Glassco, Reg.

Car Wheels and Axles:
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Hardy Patent Picks Co.
Sam'l Osborn (Canada) Ltd.
Hull Iron & Steel Foundries, Ltd.
John J. Garthshore.
Peacock Brothers, Limited.
Powley & Moody, Limited.
The William Kennedy & Sons, Ltd.

Cast Steel Gears:
Canada Foundries, Ltd.
The William Kennedy & Sons, Ltd.

Castings (Iron and Steel):
Herbert, Alfred, Limited.
Holman, Bros., Ltd.
Hardy Patent Picks Co.
Sam'l Osborn (Canada) Ltd.
Peacock Brothers, Limited.
The William Kennedy & Sons, Ltd.

Cement Machinery:
Hadfields, Limited.
Hull Iron & Steel Foundries, Ltd.
The William Kennedy & Sons, Ltd.

Chains:
Dodge Manufacturing Co.
Jones & Glassco, Reg.
Canadian Link-Belt Co., Ltd.
Greening, B. Wire Co., Ltd
Powley & Moody, Limited.

Chain Drives:
Jones & Glassco (Regd).
Powley & Moody, Limited.

Chain Drives — Silent & Steel Roller:
Link-Belt Limited.
Hans Renold of Can., Ltd
Jones & Glassco (Regd.).

Chemist:
Thos. Heyes & Sons.
Milton Hersey Co.
Ledoux & Co

Classifiers:
The Dorr Company.

Clutches:
Link-Belt Limited.
Hans Renold of Can., Ltd.

Coal:
Dominion Coal Co.
Nova Scotia Steel & Coal Co.

Coal Cutters — Coal Pick Machines:
Sullivan Machinery Co.
Canadian Ingersoll-Rand Co., Ltd
Hardy Patent Picks Co.
Sam'l Osborn (Canada) Ltd.
Hebert, Alfred, Limited.
Holman Bros., Ltd.
Peacock Brothers. Limited.

Coal Crushers & Conveyors:
Link-Belt Limited.
Peacock Brothers, Limited.

Coal Mining Machinery:
Canadian Ingersoll-Rand Co., Ltd
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co. Ltd
Hadfields, Limited.
Hendrick Mfg. Co.
Hebert, Alfred, Limited.
Holman Bros. Ltd
Powley & Moody, Limited.
Sullivan Machinery Co.

Coal Screening Plants:
Link-Belt Limited.
Canadian Mead-Morrison Co

Cobalt Oxide:
Deloro Smelting & Refining Co., Ltd.

Compressers — Air:
Belliss & Morcom, Ltd.
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd
Denver Rock Drill Mfg. Co.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Laurie & Lamb
Smart-Turner Machine Co.
Peacock Brothers, Limited.

Concentrating Tables:
Herbert, Alfred, Limited.
Holman Bros., Ltd.
The Mine & Smelter Supply Co

Concrete Mixers:
Canadian Fairbanks-Morse Co., Ltd
Gould, Shapely & Muir Co., Ltd

Condensers:
Canadian Ingersoll-Rand Co. Ltd.
Belliss & Morcom, Ltd.
Laurie & Lamb.
Peacock Brothers, Ltd.

Condensers — Electrical Static & Power:
Griswold & Co.

Consulters and Engineers:
Milton Hersey Co., Ltd.

Conveyors:
Link-Belt Limited.
Canadian Mead-Morrison Co.
Jones & Glassco (Regd.).

Conveyor Belts:
Canadian Fairbanks-Morse Co., Ltd.
Gutta Percha and Rubber, Ltd.

Conveyor Flights:
Hendrick Manufacturing Co.

Conveyor — Trough — Belt:
Dodge Manufacturing Co.
Link-Belt Limited.
Hendrick Mfg. Co.
Jones & Glassco, Regd.

Copper:—
Consolidated Mining & Smelting Co.

Countershaft Fixtures:
Dodge Manufacturing Co.

Couplings:
Dodge Manufacturing Co.
Hans Renold of Can., Ltd.

Cranes:
Link-Belt Limited.
Canadian Mead-Morrison Co.
Peacock Brothers, Limited.

Crane Ropes:
Allan Whyte & Co.
Canada Wire & Cable Co
Greening B., Wire Co., Ltd.

Crucibles:
The Mine & Smelter Supply Co.

Crusher Balls:
Canada Foundries & Forgings, Ltd.
Herbert, Alfred, Limited.
Holman, Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
Peacock Brothers, Limited.
The William Kennedy & Sons, Ltd.

Crusher Jaws:
Canadian Steel Foundries, Ltd.
The William Kennedy & Sons, Ltd.

Crushing Rolls:
Canadian Steel Foundries, Ltd.
The William Kennedy & Sons, Ltd.

Crushers — Jaw & Gyratory:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
Lymans, Limited.
The Mine & Smelter Supply Co.
Hadfields, Limited.

Cut Gears:
Hans Renold of Can., Ltd.
Jones & Glassco, Regd.
The William Kennedy & Sons, Ltd.

Cyanide:

Cyanide Plant Equipment:
The Dorr Co.
The Mine & Smelter Supply Co

Diamond Drill Contractors:
Smith & Travers
Sullivan Machinery Co

Diesel Engines:
Belliss & Morcom, Ltd.
Canadian Fairbanks-Morse Co., Ltd
Laurie & Lamb.
Lammers & Maase, Ltd.

Dies:
Canada Foundries & Forgings, Ltd
Herbert, Alfred, Limited.
Hull Iron & Steel Foundries, Ltd
Holman Bros., Ltd

Dredging Ropes:
Allan Whyte & Co.
Greening, B. Wire Co., Ltd

Dredges:
Canadian Mead-Morrison Co.

Dredger Pins:
Hull Iron & Steel Foundries, Ltd

Dredging Machinery:
Hadfields, Limited.
Hull Iron & Steel Foundries, Ltd

Drills — Air and Hammer:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd
Herbert, Alfred, Ltd.
Hardy Patent Picks Co
Sam'l Osborn (Canada) Ltd
Holman Bros., Ltd.
Sullivan Machinery Co.
The Mine & Smelter Supply Co

Drills — Core:
Canadian Ingersoll-Rand Co., Ltd
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Sullivan Machineery Co

Drill Steel Furnaces:
Canadian Ingersoll-Rand Co., Ltd.
Denver Rock Drill Mfg. Co
Hardy Patent Picks Co.
Sam'l Osborn (Canada) Ltd
Herbert, Alfred, Limited
Holman Bros., Ltd.
Sullivan Machinery Co.

Drills — Diamond:
Sullivan Machinery Co.

Drill Steel — Mining:
Canadian Ingersoll-Rand Co., Ltd.
Hadfields, Limited
Mussens, Limited

Drill Steel Sharpeners:
Canadian Ingersoll-Rand Co., Ltd

Drills — Electric:
Canadian Fairbanks-Morse Co., Ltd
Herbert, Alfred, Limited
Holman Bros. Ltd.
Sullivan Machinery Co.
Northern Electric Co., Ltd.

Drills — High Speed and Carbon:
Canadian Fairbanks-Morse Co., Ltd
Hadfields, Limited
Hardy Patent Picks Co.
Sam'l Osborn (Canada) Ltd.
Herbert, Alfred, Limited
Holman Bros, Ltd.

Ejectors:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd

Electric Condensers:
Griswold & Co.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd
Herbert, Alfred, Limited
Holman Bros., Limited
Northern Canada Supply Co

Electric Hoists:
Canadian Fairbanks-Morse Co., Ltd
Canadian Mead-Morrison Co

Elevators:
Dodge Manufacturing Co
Canadian Machinery Co
Sullivan Machinery Co
Link-Belt Limited.
Northern Canada Supply Co
Hadfields, Limited
Jones & Glassco (Regd.).

Engineering & Surveying Instruments:
Laurie & Lamb.

Engines — Ventilating:
Canadian Sirocco Co., Ltd

Engines, Diesel:
Canadian Fairbanks-Morse Co., Ltd
Bellis & Morcom Ltd.
Laurie & Lamb
Lammers & Maase, Ltd

Engines — Gas and Gasoline:
Canadian Fairbanks-Morse Co., Ltd
Belliss & Morcom, Ltd
Sullivan Machinery Co.
Gould, Shapely & Muir Co., Ltd
Laurie & Lamb.
The Mine & Smelter Supply Co
Powley & Moody, Limited.

Engines — Haulage:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd
Powley & Moody, Limited.

Engines — Steam:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd
Laurie & Lamb

Engineers:
Dresser, John A.
Dorr Co.
Ferrier, W. F.
Hore, R. E.
Heves & Sons, Thos.
Hersey Co. Ltd., Milton
McEvoy, James C.
Rogers, George R.
Ross, Jas. G.
Stewart, Robert H.
Tyrell, J. B.
Whitman, Alfred B.
Wilson, Ridgeway R.

Exhauster:
Canadian Sirocco, Ltd.

Ferro-Alloys (all Classes):
Canadian Steel Foundries, Ltd.

Fire Fighting Supplies:
Canadian Fairbanks-Morse Co., Ltd.
Gutta Percha & Rubber, Ltd

Flood Lamps:
Northern Electric Co., Ltd.

Flotation Oil:
Hercules Powder Co.

Fluorspar:
Consolidated Mining & Smelting Co
Everitt & Co.

Forging:
Canada Foundry & Forging, Ltd.
Herbert, Alfred, Limited
Holman Bros., Ltd.
Hull Iron & Steel Foundries, Ltd.
Smart-Turner Machine Co.

Friction Clutches:
Canadian Fairbanks-Morse Co., Ltd.
Dodge Manufacturing Co.

Frogs: — See Switches & Turntables
Canadian Steel Foundries, Ltd.
Hull Iron & Steel Foundries.
John J. Gartshore.

Furnaces — Assay:
Lymans, Limited.
Mine & Smelter Supply Co.

Gasoline Extraction Compressors:
Canadian Ingersoll-Rand Co., Ltd.
Sullivan Machinery Co.

Gasoline Tanks — See Tanks:
Can. Chicago Bridge & Iron Co., Ltd.
Horton Steel Works, Ltd.
Hendrick Manufacturing Co.

Gaskets:
Gutta Percha & Rubber, Ltd.

Gears:
Hans Renold of Canada, Ltd.
Jones & Glassco, Regd.
The William Kennedy & Sons, Ltd.

Gears (Cast):
Link-Belt Limited.
The William Kennedy & Sons, Ltd.
Hull Iron & Steel Foundries, Ltd.

Gears: Machine Cut:
The Hamilton Gear & Machine Co.
The William Kennedy & Sons, Ltd.

Gold Refiners:
Goldsmith Bros.

Gold Pans:
Can. Chi. Bridge & Iron Works, Ltd.
Horton Steel Works, Ltd.

Grab-Buckets:
Canadian Mead-Morrison Co.

Hangers:
Canadian Fairbanks-Morse Co., Ltd.
Dodge Manufacturing Co.

Hose:
Canadian Fairbanks-Morse Co., Ltd.
Goodyear Tire & Rubber Co.
Gutta Percha & Rubber, Ltd.
Dunlop Tire & Rubber Co.

Hangers and Cables:
Stan. Underground Cable Co., Ltd.

Heating Systems:
Canadian Sirocco Co., Ltd.

High Speed Steel:
Hadfields, Ltd.
Hardy Patent Picks Co.
Sam'l Osborn (Canada) Ltd.

Hoists — Air, Electric and Steam:
Canadian Ingersoll-Rand Co., Ltd.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Dodge Manufacturing Co.
Herbert, Alfred, Ltd.
Holman Bros., Ltd.
Jones & Glassco, Regd.
Mine & Smelter Supply Co.
Link-Belt Limited.
Peacock Bros., Ltd.
Sullivan Machinery Co.

Hoisting Towers:
Canadian Mead-Morrison Co

Hoppers:
Dodge Manufacturing Co.

Hydraulic Machinery:
Hadfields, Ltd.
Belliss & Morcom, Ltd.
Laurie & Lamb.
The William Kennedy & Sons, Ltd.

Industrial Chemists & Inspectors:
Hersey, M. & Co., Ltd.

Insulating Compounds:
Standard Underground Cable Co.

Jacks:
Canadian Fairbanks-Morse Co., Ltd.
Northern Canada Supply Co.

Jaw & Gyratory Crushers. See Crushers:

Lamp-Miners:
Northern Electric Co
Peacock Bros., Ltd
Powley & Moody, Limited.

Lead (Pig):
Consolidated Mining & Smelting Co

Link Belt — See Chain Drives:

Locomotives (Steam Compressed Air and Storage):
Canadian Ingersoll-Rand Co., Ltd
Laurie & Lamb
Powley & Moody, Limited.

Machine Guards:
Greening, B. Wire Co., Ltd.

Magnesium Metal:
Hull Iron & Steel Foundries, Ltd.

Manganese Steel, See Steel, Manganese:
Canadian Steel Foundries, Ltd
Hadfields, Ltd.
Hardy Patent Picks Co.
Sam'l Osborn (Canada) Ltd.

Metal Merchants:
Consolidated Mining & Smelting Co
C. L. Constant Co.

Metallurgical Engineers:
The Dorr Co.

Metallurgical Machinery:
Dwight & Lloyd Sintering Co
The Dorr Co.
The Mine & Smelter Supply Co.

Metal Work, Heavy Plates:
Can. Chicago Bridge & Iron Co., Ltd
Horton Steel Works, Ltd.
Hendrick Manufacturing Co.
The William Kennedy & Sons, Ltd
Powley & Moody, Limited.

Mica:
Everitt & Co.

Mine Cars — See Cars, Mine:
The William Kennedy & Sons, Ltd.
Powley & Moody, Limited.

Mining Engineers:
Hersey, M. & Co., Ltd.

Mining Requisites:
Dominion Wire Rope Co., Ltd.
Hadfields, Limited.
Hull Iron & Steel Foundries, Ltd.
Powley & Moody, Limited.

Mining Ropes — See Cable:

Mine Surveying Instruments:
C. L. Berger & Sons.

Molybdenite:
Everitt & Co.

Motors:
Canadian Fairbanks-Morse Co., Ltd.
Peacock Brothers, Ltd.
Powley & Moody, Limited.

Motor Pulleys:
Canadian Fairbanks-Morse Co., Ltd.
Dodge Manufacturing Co.

Nickel:
The Mond Nickel Co., Ltd.

Oil Engines — Reverse:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Ingersoll-Rand Co., Ltd.

Oil Storage Tanks — See Tanks:
Can. Chicago Bridge & Iron Co., Ltd
Horton Steel Works, Ltd.
Hendrick Manufacturing Co.
The Toronto Iron Works, Ltd.

Ore Handling Equipment:
Link-Belt Limited.
Canadian Mead-Morrison Co.
Herbert, Alfred, Limited.

Ore Sacks:
Northern Canada Supply Co.

Ore Testing Works: See Assayers & Chemists:

Ores & Metals—Buyers & Sellers of:
Geo. G. Blackwell.
Consolidated Mining & Smelting Co.
Everitt & Co.

Oils:
Hercules Powder Co.

Pavers:
Wettlaufers Brothers.
Gutta Percha & Rubber, Ltd
Laurie & Lamb.

Perforated Metals:
Hendrick Mfg. Co.
Canada Wire & Iron Goods Co
Greening, B. Wire Co.

Pillow Blocks:
Canadian Fairbanks-Morse Co., Ltd.
Canadian Link-Belt Co., Ltd.

Pipes:
Canadian Fairbanks-Morse Co., Ltd.
Consolidated Mining & Smelting Co
The William Kennedy & Sons, Ltd

Pipe — Wood Stave:
Pacific Coast Pipe Co.
Mine & Smelter Supply Co.
Canadian Ingersoll-Rand Co., Ltd

Piston Rock Drill—see Drills, Air Hammer:

Plate Works:
Can. Chi. Bridge & Iron Co., Ltd.
Hendrick Mfg. Co.
The William Kennedy & Sons, Ltd
Horton Steel Works, Ltd.

Platinum Refiners:
Goldsmith Brothers.

Pneumatic Tools:
Canadian Ingersoll-Rand Co., Ltd
Herbert, Alfred, Limited.
Holman Bros., Ltd.

Portable Column Hoists: see
Canadian Ingersoll-Rand Co., Ltd
Denver Rock Drill Mfg. Co
Herbert, Alfred, Limited.
Holman Bros., Ltd
Sullivan Machinery Co.

Poultry Netting:
Greening, B. Wire Co., Ltd.

Power Factor Correcting Devices:
Griswold & Co

Power Condensers:
Griswold & Co

Prospecting Mills & Machinery:
Mine & Smelter Supply Co.

Pulleys Shafting and Hangers:
Canadian Fairbanks-Morse Co., Ltd
Dodge Manufacturing Co.
The William Kennedy & Sons Ltd

Pulleys — Iron, Steel, Wood Split:
Dodge Manufacturing Co.
Canadian Fairbanks-Morse Co., Ltd.

Pulverizers — Laboratory:
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Mine & Smelter Supply Co.

Pumps — Pneumatic:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd.
Smart-Turner Machine Co.
Sullivan Machinery Co.

Pumps — Steam:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd.
Northern Canada Supply Co.
Peacock Brothers, Ltd.
Smart-Turner Machine Co.

Pumps-Turbines:
Canadian Fairbanks-Morse Co., Ltd
Smart-Turner Machine Co.
Canadian Ingersoll-Rand Co., Ltd.
Laurie & Lamb.
Peacock Brothers, Ltd.

Pumps-Vacuum:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd.
Smart-Turner Machine Co.
Peacock Brothers, Ltd.

Pumps — Boiler Feed:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd
Peacock Brothers, Ltd.

Pumps — Centrifugal:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd.
Laurie & Lamb.
Peacock Brothers, Limited.
Smart-Turner Machine Co.

Pumps — Diaphragm:
Canadian Fairbanks-Morse Co., Ltd
The Dorr Company.
The William Kennedy & Sons, Ltd.

Pumps — Electric:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd.
Laurie & Lamb.
Peacock Brothers, Ltd.
Smart-Turner Machine Co

Pumps — Sand & Slime:
Canadian Fairbanks-Morse Co., Ltd
Canadian Ingersoll-Rand Co., Ltd
Laurie & Lamb
Mine & Smelter Supply Co
Sylvester Mfg Co., Ltd

Pumps — Valves:
Canadian Fairbanks-Morse Co., Ltd
Peacock Brothers, Ltd

Push Cars — See Cars, Push:
Canadian Fairbanks-Morse Co., Ltd
Powley & Moody, Limited.

Quarrying Machinery:
Canadian Ingersoll-Rand Co., Ltd.
Canadian Rock Drill Co.
Denver Rock Drill Mfg. Co., Ltd.
Herbert, Alfred, Limited.
Holman Bros., Ltd.
Sullivan Machinery Co.

Quills:
Dodge Manufacturing Co.

Rails:
Canadian Fairbanks-Morse Co., Ltd
Hadfields, Limited.
John J. Gartshore.
Powley & Moody, Limited.

Refiners:
Goldsmith Brothers

Riddles:
Hendrick Mfg. Co.

Rod Mills:
Mine & Smelter Supply Co.

Roll Shells:
The William Kennedy & Sons, Ltd
Canadian Steel Foundries, Ltd.

Rolls — Crushing:
Canadian Ingersoll-Rand Co., Ltd.
Hadfields, Limited.
Hull Iron & Steel Foundries, Ltd.
Herbert, Alfred, Ltd.
Holman Bros. Ltd.
Wettlaufer Bros.

Roller Chain:
Hans Renold of Canada, Ltd.
Link-Belt Limited.
Jones & Glassco, Regd.

Rope — Manilla & Jute:
Dodge Manufacturing Co.
Jones & Glassco, Regd.
Allan, Whyte & Co.

Rope — Wire:
Canadian Fairbanks-Morse Co., Ltd
Anglo Canadian Wire Rope Co.
Allan, Whyte & Co., Ltd.
Canada Wire & Cable Co.
Canada Wire & Iron Goods Co.
Dodge Manufacturing Co.
Dominion Wire Rope Co., Ltd.
Greening, B. Wire Co.

Rope Transmission Equipment:
Dodge Manufacturing Co.

Saline Refiners:
Goldsmith Brothers.

Samplers:
Canada Metal Co.
Ledoux & Co.
Milton Hersey Co.
Thos. Heyes & Son.
Mine & Smelter Supply Co.

Screens:
Canadian Ingersoll-Rand Co., Ltd.
Greening, B. Wire Co.
Hendrick Mfg. Co.
Canada Wire & Iron Goods Co.

Screens — Cross Patent Flanged Lip:
Hendrick Mfg. Co.

Screens — Perforated Metal:
Hendrick Mfg. Co.

Screens — Shaking:
Link-Belt Limited.
Hendrick Mfg. Co.

Screens — Revolving:
Link-Belt Limited.
Hendrick Mfg. Co.
The William Kennedy & Sons, Ltd.

Separators:
Smart-Turner Machine Co.
Mine & Smelter Supply Co.

Sewer Pipes:
Wettlaufer Bros.

Shafting:
Canadian Fairbanks-Morse Co., Ltd.
Dodge Manufacturing Co.

Sheet Metal Work:
Hendrick Mfg. Co.

Sheaves:
Dodge Manufacturing Co.

Sheets — Genuine Manganese Bronze:
Hendrick Mfg. Co.

Sheets and Dies:
Hull Iron & Steel Foundries, Ltd.
Peacock Brothers, Ltd.
The William Kennedy & Sons, Ltd.

Ship Loaders: see Conveyors
Canadian Mead-Morrison Co.

Silent Chain: See Chain Drives
Powley & Moody, Limited.
Silent & Steel Roller—See Roller Silent Steel.

Sledges:
Canada Foundries & Forgings.

Sleeves:
Dodge Manufacturing Co.

Sintering:
Dwight & Lloyd Sintering Co., Inc.

Smelters:
Goldsmith Bros.

Smoke Stacks:
Can. Chicago Bridge & Iron Co., Ltd.
Horton Steel Works, Ltd.
Hendrick Mfg. Co.
The William Kennedy & Sons, Ltd.

Special Machinery:

Spelter:
The William Kennedy & Sons, Ltd
Consolidated Mining & Smelting Co.

Sprockets:
Canadian Fairbanks-Morse Co., Ltd.
Hans Renold of Canada, Ltd.
Canadian Fairbanks Morse Co., Ltd.
Dodge Manufacturing Co.
Link-Belt Limited.
Jones & Glassco, Regd.
The William Kennedy & Sons, Ltd.

Spring Coil & Clips Electric:
Canadian Steel Foundries, Ltd.

Stamp Batteries:
Herbert, Alfred, Limited.
Holman Bros., Ltd.

Stamp Forgings:
Canada Foundries & Forgings, Ltd.
Hull Iron & Steel Foundries.

Steel Barrels:
Smart-Turner Machine Co.

Steel Castings:
Canadian Steel Foundries, Ltd.
Canadian Brakeshoe Co., Ltd.
Hull Iron & Steel Foundries, Ltd.
Hadfields, Ltd.
Hardy Patent Picks Co.
Sam'l Osborn (Canada) Ltd.
The William Kennedy & Sons, Ltd
Denver Rock Drill Mfg. Co., Ltd.
Sullivan Machinery Co.
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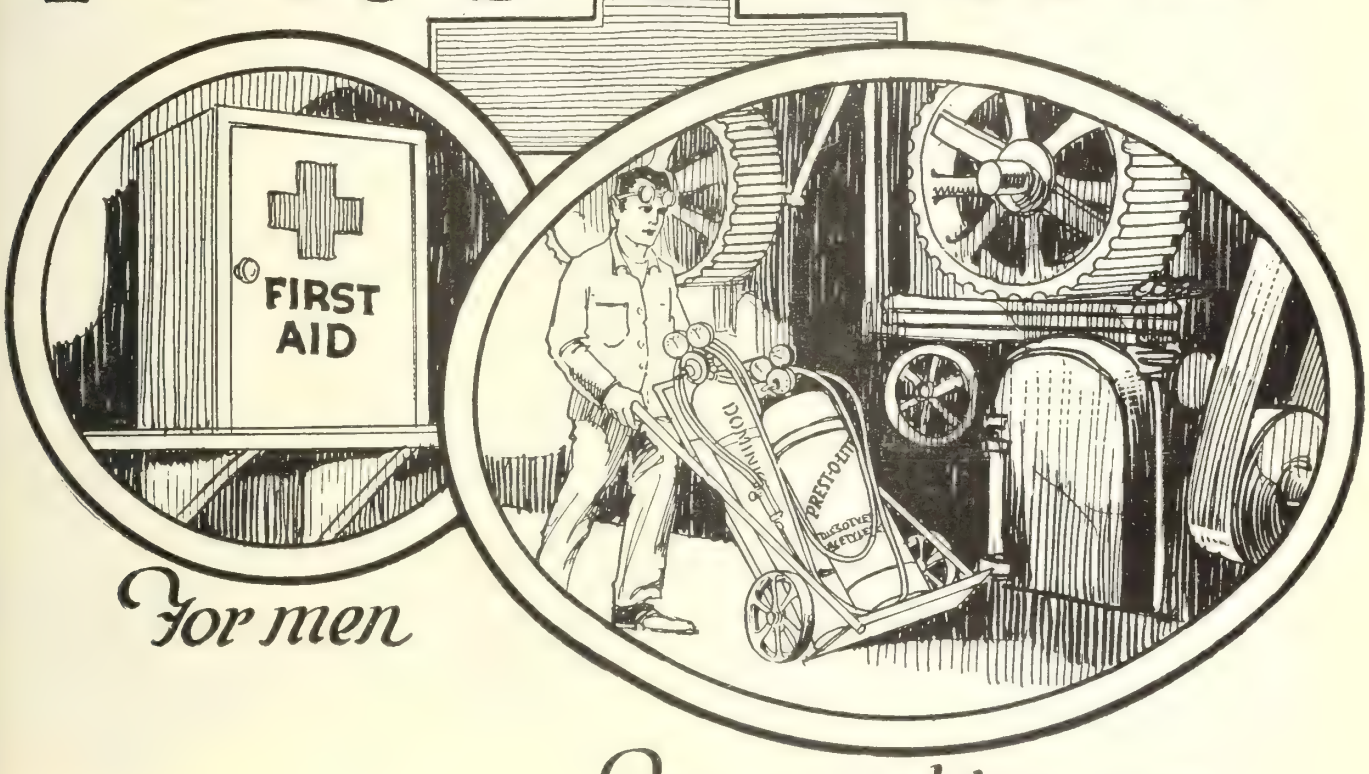

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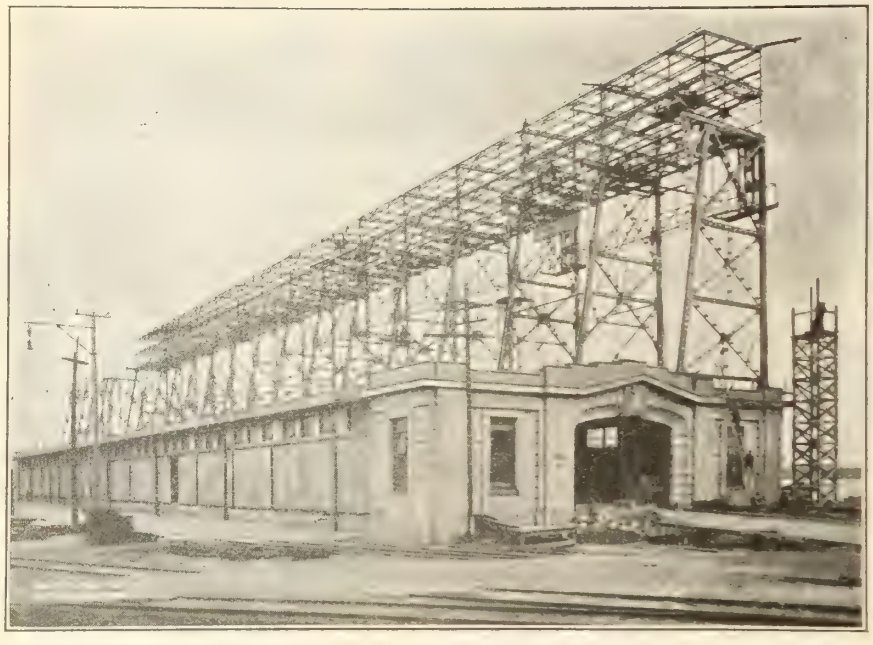

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Ontario's Minerals

PROVINCE OF ONTARIO

Hon. CHARLES. McCREA, Minister. DEPARTMENT OF MINES *Thos. W. Gibson*

Mineral Areas

Ontario, with its 407,262 square miles, contains many millions of acres in which the geological formations are favourable for the occurrence of minerals 70 per cent of the area being underlain by rocks of pre-Cambrian age. The phenomenally rich silver veins of Cobalt, Gowganda and South Lorrain occur in these rocks; so also do the far-famed nickel-copper deposits of Sudbury, the gold of Porcupine and Kirkland Lake, and the iron ore of Magpie and Moose Mountain mines.

Economic Minerals

In addition to the above, practically all economic minerals (coal and tin excepted) are found in Ontario: — actinolite, apatite, arsenic, asbestos, cobalt, corundum, feldspar, fluorspar, graphite, gypsum, iron pyrites, lead, mica, molybdenite, natural gas, palladium, petroleum, platinum, quartz, salt, talc and zinc. This Province has the largest deposits on the continent of talc, feldspar, mica and graphite.

Building materials, such as ornamental marble, limestone, sandstone, granite, trap, sand and gravel, lime, Portland cement, brick and tile, meet every demand.

Mineral Production

Preliminary returns show the output of the mines and metallurgical works of the Province for the year 1922 to be worth $62,202,169, of which the metallic production was $38,190,711.

The following figures show the growth of Ontario's mineral industry by five-year periods since 1891 when a Bureau of Mines was first established.

Year.	Value.	Year.	Value.
1891	$4,705,672	1911	$41,976,797
1896	5,235,003	1916	65,303,822
1901	11,831,086	1918 (Maximum war output)	80,308,972
1906	22,388,383	1921	48,128,387
	Dividends.		

Dividends and bonuses paid to the end of 1922 amounted to $28,096,699 for gold mining companies, and $86,238,185 for silver mining companies or a total of $114,334,884.

Mining Regulations

A miner's license costs $5.00 per annum, and entitles the holder to stake out in any or every mining division three claims of 40 acres each. After performing 200 days' assessment work on a claim, patent may be obtained from the Crown on payment of $2.50 or $3.00 per acre, depending on location in unsurveyed or surveyed territory.

Assay Office

The Provincial Assays Office at No. 5 Queen's Park, Toronto, is maintained by the Department of Mines for the free identification of minerals, free assays under the provisions of the Mining Act of Ontario, and also for general assay work as per the Schedule of Charges which may be obtained on application.

Temiskaming Testing Laboratories

The Department maintains, at Cobalt, an ore sampling and testing laboratory which is now prepared to receive parcels of gold ore from 100 pounds upward, and after sampling and assaying the same to pay to the shipper the value thereof, less treatment charges. The purpose is to afford a market for ores extracted by prospectors and others in developing their mining claims, enabling them to obtain funds which they can use for further work and to report on the most satisfactory method of treatment. Fuller information may be obtained on application to the Manager, Temiskaming Testing Laboratories, Cobalt, Ontario.

Publications

For list of publications, illustrated reports, geological maps and mining laws, apply to

Thos. W. Gibson,
Deputy Minister of Mines.
TORONTO, CANADA

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DEPARTMENT OF MINES

HON. CHARLES STEWART, *Minister* **CHARLES CAMSELL, *Deputy Minister***

MINES BRANCH

Recent Publications

Talc and Soapstone in Canada, by H. S. Spence.

Titanium, by A. H. A. Robinson.

Summary Report of Investigations made by the Mines Branch during the calendar year ending Dec. 31, 1921.

Phosphate in Canada, by H. S. Spence.

The Preparation, Transportation and Combustion of Powdered Coal, by John Blizard.

Road Materials along the St. Lawrence River, from Quebec Boundary to Cardinal, Ont., by R. H. Picher.

Barium and Strontium in Canada, by H. S. Spence.

The Coal-fields and Coal Industry of Eastern Canada, by F. W. Gray.

Analyses of Canadian Fuels. Part I to V, by E. Stansfield, M. Sc., and J. H. H. Nicholls, M. Sc.

Graphite, by H. S. Spence.

Gas Producer Trials with Alberta Coals, by J. Blizard and E. S. Malloch.

The Mines Branch maintains the following laboratories in which investigations are made with a view to assisting in the developing of the general mining industry of Canada:—

Fuel Testing Laboratory.—Testing value of Canadian fuels for steam raising and production of power gas; analyses, and other chemical and physical examinations of solid, liquid and gaseous fuels are also made.

Ore-Dressing Laboratory.—Testing of Canadian ores and minerals, to ascertain most economical methods of treatment.

Chemical Laboratory.—Analyzing and assaying of all mineral substances and their manufactured products. Copies of schedules of fees, which are lightly in excess of those charged by private practitioners, may be had on application.

Ceramic Laboratory.—Equipment is such that complete physical tests on clays and shales of the Dominion can be made, to determine their value from an economic standpoint.

Structural Materials Laboratory.—Experimental work on sands, cements and limes is also undertaken.

Applications for reports and particulars relative to having investigations made in the several laboratories should be addressed to **The Director, Mines Branch, Department of Mines, Ottawa.**

GEOLOGICAL SURVEY

Recent Publications

Memoir 108. The Mackenzie River Basin, by Charles Camsell and Wyatt Malcolm.

Memoir 127. Beauceville map-area, Quebec, by B. R. MacKay.

Memoir 128. Winnipegosis and Upper Whitemouth River areas, Manitoba, Pleistocene and Recent deposits, by W. A. Johnston.

Memoir 129. Geology of the Moncton map area, by W. J. Wright.

Memoir 130. Geology and mineral deposits of the Bridge River map-area, British Columbia, by W. S. McCann.

Memoir 131. Kenogami, Round and Larder Lake areas.

Memoir 132. Geology and ore deposits of Salmon River district, British Columbia, by S. J. Schofield and G. Hanson.

Memoir 133. The southern part of the Sydney coal field, Nova Scotia, by A. O. Hayes and W. A. Bell.

Map 68A. Moncton, New Brunswick. Geology.

Map 155A. Portions of the districts of Algoma, Sudbury and Timiskaming, Ontario. Geology.

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Map 1752. Monitor, Alberta and Saskatchewan. Topography.

Map 1767. Sydney, Nova Scotia. Geology.

Map 1830. Vermilion; townships 47 to 55, ranges 5 to 10, west of the fourth meridian. Topography.

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Map 1860. Keno Hill area, Mayo district, Yukon. Geology.

Map 1948. Wanapitei Lake area, Ont. Geology.

Map 1964. Brockville-Mallorytown area, Leeds county, Ontario. Geology.

Map 1965. Fraser River delta, British Columbia. Geology.

Map 1972. Michipicoten area, Ontario. Geology.

Map 1977. Mackenzie river between Norman and Beaver river, district of Mackenzie. Geology.

Applicants for publications not listed above should mention the precise area concerning which information is desired.

Summary Report.—The annual Summary Report of the Geological Survey is now printed in parts. Applicants should, therefore, state what particular geologist's re-

The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon.

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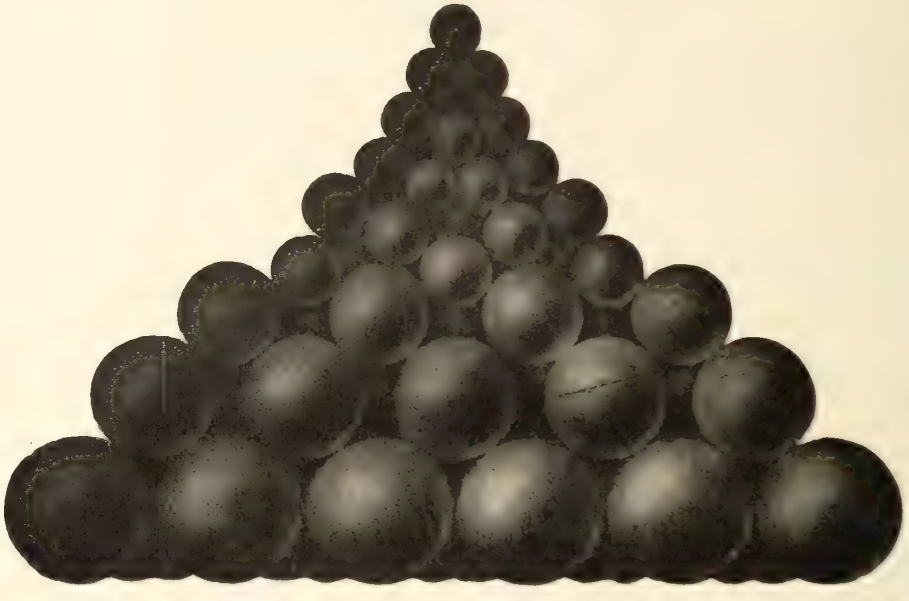

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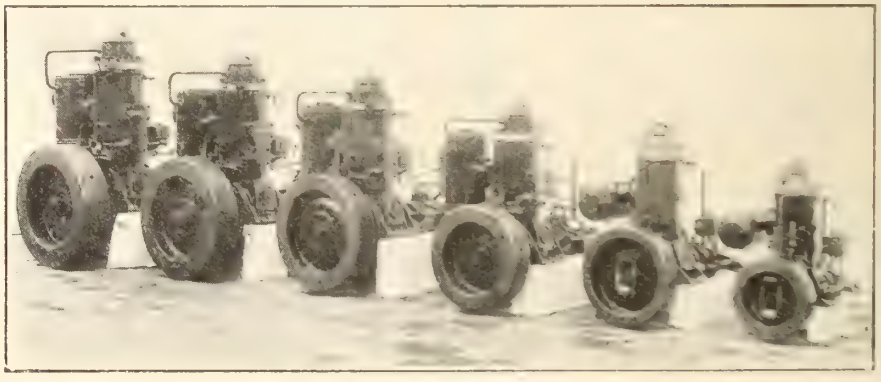

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A CHRISTMAS MESSAGE

In viewing the great problems that face the world to-day, one cannot but be struck by the divergence of views that are held and by the pertinacity with which opposing factions adhere to their tenets. Indeed, it would appear as though some strange distortion of the facts of life were militating to-day against a straightforward solution of our many problems, and one is tempted to inquire whether there are grounds for this conclusion.

The many avenues of progress that lie before modern men have led them in diverging directions. Some of these roads still point forward, some go off at a tangent, and some even turn backward. As a result a multiplicity of viewpoints has been adopted by various persons, families, classes, and even nations, each secure in the conviction that his or their particular viewpoint is the right one, and that others are wrong.

Particularly in these days of specialization, when intensive effort tends to hedge itself about with the litter from its own progress, do we find it increasingly difficult to preserve a common viewpoint; we see our own point too well and the other man's, too little. In other words, the tendency is to lose one's sense of perspective, and for lack of it many a discussion or conference ends where it began. We vastly enjoy discussions, they present such admirable opportunities for the ventilation of ideas; but the trouble is that, generally speaking, the ventilation is too good and a draught results that carries the ideas *in tenues auras*. Regulated ventilation is one thing; a whirlwind is quite another, as it is proverbially destructive.

Some form of guidance towards a common end is necessary in this conflict of ideas, and when we see the number of divergent views increasing and the weight of opinion swaying this way and that towards some unseen goal, without consistent direction and with much lost motion, it is surely evidence that, somehow or other, we have lost our sense of perspective.

We may state quite definitely that perspective is no more than a name unless it involves a common understanding and a united aim. A sense of perspective involves the ability to see ahead, which is the peculiar faculty that inspires initiative. It was the late Elbert Hubbard who remarked that Initiative shared with a Rich Pa the chief responsibility for the deliverance of a boy from the attack of Destiny, waiting around the corner with a Stuffed Club.

Not to everyone is given the power both to see and to do; but perception is the prior requisite.

Initiative is a dangerous attribute without proper guidance; and if our intensive studies and our scientific achievements have loaded us with such a burden of responsibility and have blinded us with such magnificence of discovery that we cannot lift our heads and look forward, to see where we are going, we are in danger of disaster. When a ship is launched, there must be no wobbling and the ways must be well greased, lest the auspicious event be marked only by bubbles at the end.

We are about to launch upon a New Year. The attractions and distractions that characterize present-day life are bewildering in their kaleidoscopic variety. No man among us can tell how the turn of events may fashion even his own individual view; we all think we are right,—but what is the truth?

There is an erroneous idea that democracy calls for the untrammeled growth of individual opinion, that freedom comes before the law; but that is not the way of nature. There is *purpose* in all the works of nature, just as there is a vanishing point to every picture; and we shall never have our picture in perspective until a common purpose directs our actions.

There is no industry that does not suffer from the unsettled conditions in the world to-day. We ardently desire a full measure of prosperity in our mining industry; but we know full well that this can be no more than a dream until there is at least a partial settlement in the conflict of nations, creeds and parties. It is singleness of purpose alone that will bring order out of the chaos to which man's inventive powers have led.

[illegible] PEACE AND GOODWILL TOWARDS MEN.

ALL-LAND ROAD TO GOLD-FIELD ASSURED

[illegible] discretion and with dispatch. Last week we noticed in these columns the faulty location of the new winter road from Angliers on the Quinze river northward to the gold belt. The contract for cutting this road specified the foot of Lake Opasatika as its terminus, and

it was intended to use the ice of the lake for the remaining sixteen miles. As we go to press we learn that Hon. J. E. Perrault has authorized an all-land route, and that orders have gone forward to the contractor now engaged on the road to continue it to Boischatel township, where it will join the present east-west road. Mr. Perrault is to be congratulated on the promptitude with which he has attended to this matter.

PLATINUM IN SOUTH AFRICA

Two weeks ago we printed an account by Mr. Max Bauman of the discovery by himself and associates of a platinum-bearing "reef" in South Africa, about one hundred miles north of Pretoria. This was from a paper presented before the Chemical, Metallurgical and Mining Society of South Africa, and was couched in most moderate terms, with plenty of substantial evidence for the conclusions drawn, and full warrant for the deductions. In brief, it described a vein or series of veins, several miles in length, in which the preliminary prospecting work then accomplished indicated shoots of payable platinum ore. The ore is described as brecciated quartz filling a fracture zone in felsite rock in the Bushveld complex. Today we print some additional descriptions, from other sources.

Platinum is one of the most difficult metals to determine by assay or analysis. There are probably not over half-a-dozen assayers in Canada who can be depended upon to determine it accurately in the various ores in which it occurs. It is quite possible that, as was the case with nickel thirty years ago, its presence in payable quantities has been overlooked, even here inCanada, where its occurrence in the Sudbury ores should keep us on the look-out for it. The new find in the Transvaal, demonstrating an unsuspected occurrence of the precious metal, may well result in a closer search and similar discoveries in other parts of the world, particularly here in Canada, where the great intrusive igneous mass underlying the Bushveld is duplicated on a smaller scale at Sudbury, and is simulated in other parts of our pre-Cambrian area.

PEAT FUELS, LIMITED

Last month we announced the fact that a supply of peat fuel is assured for the season of 1924, through private enterprise. Mr. Kennedy Stinson, of Montreal, has given his personal bond to the Dominion government and has acquired the peat manufacturing plant at Alfred, Ontario, on undertaking to put it in operation by May of next year. Mr. E. V. Moore, formerly engineer for the Peat Committee, has completed the plans required to change the plant from steam to electric drive, as recommended in the final report of the Peat Committee, and peat fuel to the amount of at least 15,000 tons and of the same superior quality as that made in 1922 will be available to the public.

While the Peat Committee was still operating the plant at Alfred, Mr. Stinson, who conducts a wholesale and retail fuel business in addition to other commercial activities, offered to buy the whole output of the plant. He and his associates have decided now, however, to adopt a more liberal policy of distribution than this during their first season as private operators. Since the people of Ontario paid a large part of the $350,000 required to conduct the experiments of the Peat Committee, they are to have the refusal of a large part of the 1924 output. The sale of the entire output for next year is already guaranteed by large orders; but the small users who already have shown their interest in peat by buying it are to have first chance.

Peat Fuels, Limited, has been organized by Messrs. Stinson and Moore and some associates, to operate the plant at Alfred in the first instance, and then to build and operate additional plants at strategic points as circumstances may direct. In other words, the express object of Peat Fuels is to develop a peat industry in Ontario and Quebec, commencing at the Alfred bog. This will be done either by increasing the capital stock of the present company or by forming subsidiaries. What dimensions the peat industry will assume finally, only time will tell; but many of us who have investigated the plant and have used the fuel are confident that it will replace much of the anthracite used at present.

Peat Fuels, Limited, have now offered for public subscription $85,000 of 7 per cent. preference stock, with a bonus of common stock, with a view to meeting the expense of altering the peat plant to electric drive and making it ready to operate next spring. We have examined into their proposals as carefully as we can, and find that they are sound and equitable in every respect. The financial return to the promoters of the project will come almost entirely from dividends on common stock (of which they will hold the majority of the shares), after preference dividends have been paid. They themselves are taking most of the risk (such as it is); they ask the public to join them.

The new company is commencing its career under unusually favourable auspices. It has been demonstrated to the satisfaction of the Peat Committee, the Deputy Ministers of Mines at Ottawa and Toronto, and all others who have taken the trouble to examine at first hand the data available, that peat fuel can be made by the Anrep-Moore process for $3.50 per ton, on the cars—a cost that will allow of a good profit at competitive selling prices. Two governments are sympathetically disposed towards the project, and have recommended it unequivocally to the public. The Quebec government has offered a bonus for the production

f peat fuel within the province. The company now wns all the patents, plans and other assets formerly eld by Mr. Moore and his associates in the peat roject. The company has the financial backing and he practical advice and guidance of one of Montreal's uccessful business men, who has followed closely the ork of the Peat Committee from beginning to end.

Few new business undertakings commence under uch favourable auspices as Peat Fuels. We can re- ommend it without qualification to the attention of he investing public.

"DUMPING" OF AMERICAN COAL IN WINNIPEG

Mr. George R. Pratt, representative of the govern- nent of Alberta in Winnipeg on behalf of Alberta oal producers, continues his vigorous protests against he "dumping" of American coal in Manitoba, where he price has been cut below that at which the Alberta perators can make a profit. He points out, in a letter ecently to the Winnipeg *Tribune*, that these Am- erican coal men are certainly not philanthropists, and that they expect to make up in the future the loss incurred by this price-cutting. Certain Manitoban officials are pluming themselves for having saved an amount estimated to be $225,000, by buying cheap Am erican coal — a direct result of the effort of Mr. Pratt and his associates to introduce Alberta coal. It is a shortsighted bargain they have made.

Mr. Pratt points out that small consumers, that is the general public, have not benefited by a corres- ponding reduction in the price of their fuel. The same dealers who have cut prices on the government con- tracts are holding up their prices to top notch so far as domestic consumers are concerned.

This may well be a case requiring special investiga- tion by a public authority. American coal is being sold deliberately and openly to the government of Manitoba at rates lower than those across the border in the United States. We have "anti-dumping" laws to protect some of our industries. Cannot these be used to prevent this unfair competition against Alberta coal in Winnipeg?

THE STAKING REGULATIONS IN QUEBEC

A letter from two prospectors in Rouyn township, Quebec, Messrs. MacDonald and Thompson, which ap- pears on another page, sets forth the "land grabbing" propensity of a number of trained mining men who have been operating in the district. This is given, ap- parently, as an excuse for the same fault among pros- pectors; but of course it is inexcusable under any cir- cumstance to "blanket" land to such an extent as to exclude possible neighbors who might assist in ex- ploring and opening up the district.

Messrs. MacDonald and Thompson have a peculiar right to discuss this matter. They are among the best known prospectors in the north country, and have not been greedy in staking. Mr. MacDonald particularly works like a beaver on his claims, and withal finds time to entertain a wide circle of friends, so that "Bert's" cabin in the woods has something of the nature of a rustic hotel, with the notable difference that he will never accept anything but thanks for his hospitality.

This wholesale staking of land in "rush" localities is not of itself particularly objectionable, except inso- far as it gives too large a share of the public domain to one man, merely for his ability to run across the country and plant stakes. The serious thing is that by this means large tracts of land that ought to be prospected are often withheld from development, from either the inability or the disinclination of the owner to do the necessary work or have it done.

There are various reasons why much valuable pros- pecting ground in the Quebec gold belt has been, and still is, thus withheld from useful development. One reason is that some of those who hold land are simply waiting for their neighbors to make a strike, that they may then "turn over" their property at a profit. Min- ing companies and prospectors alike indulge in this practice, as well as self-confessed speculators. Another reason is that some well-intentioned companies or in- dividuals, who are able and willing to investigate their properties, do not feel that the time has yet arrived to spend the money to do it; they are willing that someone else should do the pioneering. Still another reason, which applies principally to professional claim stakers and less often to real prospectors, is that they sometimes ask an exorbitant figure for their proper- ties and, being unable or unwilling to investigate the ground themselves, are thus in the position of the dog in the manger.

This "blanketing" and "land-grabbing" is a habit confined to no particular section of the mining and prospecting fraternities, and is reprehensible in all cases. Land must be pre-empted for prospecting by staking, under present conditions; but it should be neither "hogged" nor withheld from development. The regulations at present in force allow of both, and should be amended to prevent either. The administra- tion of the Bureau of Mines at Quebec are investigat- ing the matter, and no doubt more effective measures will be enacted at the next session of the legislature.

SPECTACULAR GOLD SPECIMENS

The rush to Fournière and Malartic townships, just to the west of Lac de Montigny and 65 to 70 miles east of the interprovincial boundary along the gold belt in Quebec, was stimulated by some spectacular spe- cimens of ore brought out to Quebec a few weeks ago, coupled with a report that geological conditions favour- able to the occurrence of payable ore had been found there. The specimens (for they were not samples, strictly speaking) showed an unusual proportion of coarse gold.

Secondary Enrichment at Keeley Mine

By J. MACKINTOSH BELL

A Study of Deep Weathering in this Famous Silver Mine

A further study of the oxidized zones in the Keeley Mine, South Lorrain, Ontario, was given recently by Dr. J. Mackintosh Bell in a paper before the Society of Economic Geologists, and is published in the October-November number of *Economic Geology*. From it the following is abstracted:

One at least of the oxidized sections at the Keeley is not shallow, but has been followed downward level by level and is still conspicuous at the deepest horizon yet attained, namely, 480 feet. (Since writing this paper, a new horizon at 560 feet has been developed to some extent, and it is noteworthy that the oxidation still continues in the section in question.)

What is the reason for this relatively deep oxidation — so unsual in a region which has been generally so intensely glaciated? What effect has the oxidation had upon the segregation of values?

Topography.

The Keeley mine is situated in the district of South Lorrain, about sixteen miles southeast of Cobalt, of which it forms a geological outlier, and to which it is subsidiary from a commercial standpoint. The mine lies on the crest of hills nearly 600 feet above and about three miles west of Lake Timiskaming. The rise from Lake Timiskaming is not steady, the intervening country being broken by several ridges separated by relatively deep valleys containing lakes and streams. These valleys have commonly a general parallelism to the main axis of the adjacent portion of Lake Timiskaming.

Southwestward of the Keeley is the deep basin of Trout Lake, with its main axis again lying north and south or approximately that of Lake Timiskaming. Both the eastern and western shores are high and abrupt, but from its northeastern bay a depression in the hills radiates northeastward, and another northward, through and beyond the Keeley properly. From the nothwestern bay, a third but less marked depression passes northwesterly. These various topographical features require emphasis in view of the fact that certain of them have apparently a marked bearing on the problems presented.

General Geology.

Though the depressions of the 80-acre tract covered by the Keeley mine are relatively deeply filled with boulder clay and much of the rest of the property shrouded in similar glacial debris, exposures of solid rock are of common occurrence. These consist of Keewatin rocks, lamprophyre dikes, and Nipissing diabase, which have been so fully described elsewhere that an elaborate petrographical description need not be given.

The diabase, occurring as a wide sill, has been intruded in such manner as to assume the form of a broad dome, which has been truncated by erosion. The veins of the Keeley are associated with the westerly dipping limb of the dome and occur either in the diabase itself or in the Keewatin rocks beneath which the sill plunges.

The faulting in the vicinity of the Keeley has a marked influence on the topography, as previously indicated, and the comprehension of the latter, in suitable geological surroundings, forms an important guide to prospecting. While all the principal faulting exposed at the mine seems to have occurred mainly, at least, prior to the mineralization, it must not be supposed that conversely all the faults are mineralized.

The faults studied in the Keeley workings appear to be reverse in character, the greatest throw not exceeding fifty feet. While the faulting in South Lorrain has been, as yet, only very broadly studied, the surmise that all the minor dislocations are connected with the major movement, primarily responsible for the deep basin of Lake Timiskaming, forms an attractive and probable hypothesis, for which there is considerable supporting field evidence.

Character of the Veins.

What may be described as the "Mother Lode" of the western section of South Lorrain is Wood's vein, which has been traced in the underground workings almost across the Keeley and located also in the properties to the north and south. Along its generally north and south strike, it has a length of at least a mile. The pronounced fault which it occupies resembles the Cobalt Lake fault, in being the fracture of paramount control in influencing the distribution of the veins; but it differs therefrom in the remarkable strength of the vein-material contained and in the smaller amount of gouge. With a general parallelism to Woods occur in the Keeley a number of other north and south veins, and roughly transverse to it, a multiplicity of others.

The Keeley veins, like those of Cobalt, are ordinarily in the association and paragenesis of the minerals contained; in the origin of their ore-shoots; in their structural characteristic; and in other details, that it will be advisable here to emphasize the differences rather than to reiterate features that have already received much attention from various writers.

The Keeley veins, like those of Cobalt, are ordinarily narrow, varying in width from a few inches to a few feet. Wood's vein and certain others do not always occupy a single fracture but commonly a fractured zone, which may be from five feet to (in the case of Wood's) even ten feet in width. Within this fractured zone, vein material proper does not ordinarily extend from wall to wall, but occurs in several more or less pronounced stringers. While the intervening altered country rock may be more or less impregnated with silver values, it is frequently — even adjoining very high-grade shoots — almost barren, and in contrast to the veins in the Cobalt series at Cobalt, there is ordinarily little or no impregnation of silver values beyond the generally pronounced walls.

The Ore-Shoots

While the deposits at Cobalt occur in "narrow practically vertical fissures and joint-like cracks," those of the Keeley occupy faults along which there was pronounced dislocation prior to the deposition of the vein-material. While in the minor veins there

seems to be a tendency to the segregation of the values where the dip is vertical or approaching verticality, Wood's vein, which is the most important silver producer of the Keeley, has an average dip (easterly) of only 60 deg. and rich shoots occur where the inclination is even much flatter.

While the richest ore-shoots of the Keeley occur close to, but not exactly at the contact between the diabase and greenstone, and important ore bodies are found alike in both rocks, the vertical range over which ore extends from the contact seems to be greater than in the case of Cobalt. Thus, rich ore occurs in Wood's vein down to the lowest horizon of the mine, 480 feet (where it is wholly in diabase) or a length along the dip of not less than 550 feet, and how much greater remains to be seen.

The unaltered vein material is composed of country rock more or less replaced by carbonates (chiefly calcite but with some dolomite), quartz, and metallic minerals. The metallic minerals show the same variety as at Cobalt. Smaltite, cobaltite, chloanthite, niccolite, pyrite, marcasite, arsenopyrite, chalcopyrite, native silver, argentite, ruby silver in various forms, and native bismuth are all common. Galena and sphalerite are rarer, but are apparently more conspicuous than at Cobalt. The quantity of iron-bearing sulphides contained seems to be generally much higher than at Cobalt, and it is possible that the percentage of iron in the smaltite is greater than is ordinarily the case at Cobalt.

Weathering of Vein Material

Significant as may be the various differences between the character of the Cobalt veins and those of the Keeley, already enumerated, much more impressive is the degree to which alteration of the original vein material has taken place at the Keeley as compared with that at Cobalt. There has been great alteration by meteoric waters, in many veins in various parts of the property, to depths of 100 feet or more, while the change is so intense in the southern 500 or 600 feet of Wood's vein that it will be advisable to explain it in detail.

The first level to be opened on the portion of the vein in question was at a depth of 230 feet. Here the vein-material consists mainly of a soft, puggy clay. Where this is completely oxidized (iron-stained-brown, yellow, and red; rarely copper-stained-green and blue; and still more rarely, showing traces of cobalt bloom) the quantity of silver contained, except uncommonly in the form of thin scales, is negligible even in locations structurally suitable for its disposition. On the other hand, in the partially oxidized portions, that is, where partly in the "ferrous" rather than completely in the "ferric" state, the amount of silver present is considerable. In other words, there are shoots of mill ore with irregularly distributed values. The oxidation at the 230 foot level extends into the adjoining walls, especially the foot wall, and is equally conspicuous along No. 20 vein, which branches southeasterly from the hanging wall.

Silver Follows "Ferrous" Material

At the next level down — 300 feet — conditions are similar, though the quantity of silver contained in the "ferrous" vein-material is less important. At 360 feet the vein-material is almost wholly oxidized; there is little or no bluish pug characteristic of the "ferrous" phase, the vein fissures being filled mainly with firm brown and yellow clay, almost devoid of silver.

At 420 feet, much "ferrous" material occurs, associated with the more wide-spread "ferric," with the consequent great enrichment in silver. The demarcation between "ferrous" and "ferric" is frequently extraordinarily abrupt, but it is still noteworthy that purely "ferric" material, even a few inches away from rich "ferrous" ore, is practically valueless. The silver in the "ferrous' ore occurs in the wire form, as argentite, in spongy accumulations of tiny scaly crystals resembling miniature stalactites, and as thin plates.

At the 480-foot level, the present deepest horizon of the mine, "ferrous" vein-material predominates over "ferric," resulting in longer and more persistent ore-shoots. At this horizon much more smaltite is apparent in Wood's vein than in the levels above (especially in what seems to be only slightly altered material), but by no means in the quantity or of the same character as found in the entirely unaltered ore in other parts of the mine. In No. 20 vein, branching from the hanging wall, the vein-material is almost wholly "ferrous" and the silver unassociated with cobalt minerals, in the wire form, or in the peculiar "stalactites" that are found in the level above.

Cause of the Deep Oxidation.

The suggestion has been made that the great depth of oxidation along the southern part of Wood's vein and the lesser extent in other parts of the property may be due to climatic changes since the close of the glacial period. This hypothesis may be correct, but the writer is not inclined to view it with favor, on account of the general absence of even superficial oxidation in the district in general and because of the fact that the oxidized areas of the Keeley are invariably beneath relatively deep depressions filled with boulder clay. It is believed the oxidized sections of the veins represent rather the remnants of a generally departed zone which was mainly eroded during the glacial period.

The relatively much greater depth to which oxidation extends in the southern than in the northern part of Wood's vein is probably to be connected with a pre-glacial topography the nature of which is not now quite clear. The southern part of the depression that marks the fault occupied by Wood's vein is comparatively deep and narrow and it seems feasible to suppose that protection against corrosion was given by the hard, steep walls of greenstone on either side, especially after the depression had been filled with débris by the initial advance to the ice.

In connection with the problem, there is another factor that should not be ignored. The southern part of the Keeley property is the locus of numerous faults branching from the main Wood's fault, which continues southward to and beyond Trout Lake. The surface of the lake is quite 200 feet below that of the Wood's fault at the Keeley, while the deepest part of the bottom of the lake is probably 250 feet still lower. The section of the fault in question is the main water carrier of the Keeley at the present time, and it seems reasonable to presume that in pre-Glacial times, if not more recently, there was a subterranean connection along the fault to Trout Lake, the meteoric water descending to comparatively great depths and rising under head in the lake basin.

Effect of the Deep Oxidation

Wherever "ferric" conditions exist in the Keeley mine, and notably in the southern part of Wood's vein,

the vein -material has been almost wholly deprived of the silver content, which it may safely be assumed was originally present, in view of the general character of the vein-material under comparable structural conditions in the unaltered parts of the mine. The unoxidized vein-material is generally relatively high in iron sulphides, as previously explained. With their oxidation, sulphuric acid, and acid-ferric sulphate would be liberated, dissolving silver as sulphate according to reactions detailed by Emmons.

What little microscopic work that has been done on the Keeley ores serve to corroborate the evidence, derived from analysis and gained more particularly from the careful accumulation of geological data, that a substantial part of the silver in certain of the rich shoots of the Keeley is secondary and, is derived from the impoverished, highly oxidized upper portions of the veins. In making this statement the writer does not attempt to combat the now generally accepted theory as to the hypogene origin of the primary ore in veins of the Cobalt type, to which those of the Keeley mine clearly belong. Much of the Keeley ore is probably purely primary and has gained no enrichment from descending solutions, but in other parts of the mine, where, indeed, the richest ore has been found, there would seem no reason to doubt the existence of widespread changes, which have materially altered and enhanced the value of the primary mineralization.

QUEBEC MINISTER'S REPORT

Hon. J. E. Perrault issued at Quebec this week a report on the various governmental departments of which he is the administrative head, namely Colonization, Mines and Fisheries.

It is interesting to note that during the fiscal year 1922-23, the sum of $2,452,697.69 was spent on behalf of colonization; of this, $2,000,000 was spent under the ordinary grants and $452,697.69 out of the ordinary subsidy, and the grant allowed to colonization societies.

Of winter roads, 561.42 miles were opened and completed, 881.33 miles of bad roads rebuilt and culverts of a length of 30,000 feet constructed.

Under the act sanctioned on the 14th of February, 1920, the sum of $5,000,000 at the disposal of that department, and of this $4,536,137.06, has now been expended. With this money roads covering over 3,000 miles have been opened, completed or repaired and bridges of a length of more than 10 miles built.

The condition of the mining industry is described as having greatly improved, and the output for the year closing on the 31st of December, 1922, was $18,835,153, being an increase of 18 per cent. over the figures of the previous year.

The gold regions of the northwest of the province have attracted a great number of prospectors and have been the scene of intense activity during the whole of the year. In fact, it is one of the most considerable events of the history of the mining development of the province. Several interesting discoveries have been made, and large numbers of claims are now staked. In order to facilitate the prospectors' work, adds the report, it has been advisable to open an office at Ville Marie for the registration of claims and plans for the construction of two highways, one of which will start from the Temiscamingue or southern and the other from the Abitibi or northern side, and which will both lead to the gold districts, are under consideration.

THE VALUE OF GOLD DEVELOPMENT TO NORTHERN QUEBEC

Last week Mr. John A. Dresser, president of the Canadian Institute of Mining and Metallurgy, addressed the Reform Club of Montreal, selecting as his subject the new gold field in northern Quebec and its relation to the rest of the province and to the provincial administration. The theme is a timely one, and the interest of the assembled Montrealers, mostly business men, showed that it is popular as well.

The immediate vicinity of the gold belt, Mr. Dresser pointed out, is a triangular area of 5,000 square miles south of the Transcontinental railway, which is principally good agricultural land. Along this railway, and at the southern apex of the triangle round about Ville Marie, there are already about 20,000 inhabitants, mostly on farms. The development of the gold belt, which runs though the central and southern portions of this area for a distance of 100 miles, will hasten its settlement, and will bring prosperity in its wake, due to a good local market and high prices for farm produce.

Four mining companies, the speaker noted, are now sinking shafts, and eight other substantial companies are conducting preliminary investigations. One company has committed itself to an expenditure on its property of $200,000, and another has already spent $300,000. "In the absence of definite Government reports on the value of the area," said Mr. Dresser, "these operations are the best evidences available of the estimated value of the field by those who know it best."

Referring to the responsibility of the administration in Quebec in connection with this development, Mr. Dresser said that the province has a good mining law, but that it is as yet mainly untried and will require minor alterations. A number of questions, such as the royalty or tax on gold, have not been settled yet, simply because the point has not yet been raised.

Among the duties of the Bureau of Mines will be the prompt provision of public reports by well-qualified mining geologists and of the transportation facilities upon which progress will depend so largely. In this connection the speaker recalled the famous election in Ontario, when Premier Ross won out on his T. & N. O. policy by a majority of one, and how the result of this hard-fought election and the courageous action subsequently based on a majority of one vote, soon opened up the immensely valuable Cobalt deposits, and has since populated a section of the Great Clay Belt and started Ontario on her career of gold mining.

To the Minister of Mines at Quebec there is now presented, said Mr. Dresser, a unique opportunity. Most ministers of the Crown have to search for or create the opportunities of first-rate importance that will make them notable in the public service. The present minister has his opportunity ready to hand, and it remains for him but to grasp it, and by means of sound policies, wise administration, and prompt and vigorous action, to shape and guide the destinies of a movement that promises to be the most important in the history of Quebec.

The output of coal in the United States for the first ten months of 1923 is 456,728,000 tons, which is near that of the record year, 1918.

The Wainwright Oil and Gas Area, Alberta

By G. S. HUME, Geological Survey

The Geological Survey, Ottawa, has issued the follow-g report:

Recently British Petroleums, Ltd., brought in an oil ell near Wainwright from a sand 2,019 to 2,063 feet ep. Several wells have been drilled in this general vi-nity with the result that gas has been found in consid-able quantities at several places and the outlook is fa-ourable for further exploration.

As far as known the regional structure is a terrace, that , a flattening of the general southwest dip over a con-derable area. This produces a condition favourable to e accumulations of oil and gas. It is also probable aat minor structures, such as small domes or folds perimposed on the terrace structure, account for the calization of the oil and gas into commercial pools. The dges of the terrace structure are not well defined; in act not enough data are at hand from field work to do ore than roughly outline the terrace; but from present formation it is thought the western edge of the terrace xtends northwestward from the vicinity of Hardisty to ear Viking, where it turns more to the north. From Hardisty it probably extends southeasterly. Wainwright ould thus be on the terrace at some distance from the estern edge.

Other Wells in the District

The Imperial Oil Co. drilled a well at Fabyan, six miles orthwest of Wainwright, and in this well at a depth of ,727 feet a daily flow of 14,000,000 cu. ft. of gas was btained. A small amount of oil was present, which the seaping gas sprayed over the derrick, giving rise to eports at the time that oil had been struck. Deeper rilling encountered water.

At Irma the Gratton Creek Oil Co. drilled a hole on ec. 7 Tp. 45, Range 8, W. of 4th meridian. At a depth f 1620 feet 500,000 cu. ft. of gas was struck under a ressure of 500 lbs.

The gas field at Viking is well known, there being a umber of wells with varying but large supplies of gas. t is thought there are two gas horizons, one at about ,150 feet and the other approximately 2,350 feet. The pper horizon gives the larger flow of gas. The struc-ure in this field is supposed to be a minor dome-like old on the terrace, which would explain the concentra ion of gas.

At Vegreville a well drilled to a depth of 2,000 feet found gas at 1,360 feet amounting, according to reports, to 225,000 cu. ft. A little gas also came from a depth of 1870 feet.

In a well drilled at Birch Lake on Sec. 14, Tp. 50, Range 12 W. of 4th meridian, gas was found in a sand at a depth of 402 feet, the amount being 200,000 cu. ft. At a depth of 2,018 feet 500,000 cu. ft. were obtained.

Thus it is well established there is a large gas field in the area to the northwest of Wainwright and the oil well at Wainwright will likely lead to further exploration along the terrace structure. The oil at Wainwright is of a heavy quality, analysis showing it to contain but two and a quarter percent of gasoline. While further fav ourable structures for the accumulation of oil probably exist in this area these will necessarily be of limited area and only the wells drilled on such structures can hope for success. In other words the producing wells in this, as in other areas, are localised. Owing to the heavy mantle of drift that covers the rocks over large areas in this district, structures are not easily located so that it seems probable much test drilling will be necessary before the producing areas can be determined. Under such circumstances many wells that fail to "bring in" oil will undoubtedly be drilled, a fact which the investing public will do well to bear in mind.

Letters From Readers

The Engineer as "Land Grabber"

To the Editor,
Canadian Mining Journal.

From time to time there have appeared articles in print with attendant comment about the prospectors in Rouyn township, Quebec, who taking advantage of the 200-acre claim allowed by the Quebec Mining Act, "grabbed" all the available ground in Rouyn and adjacent townships. Such a practice, various technical men have pointed out, has had a very deleterious effect on the progress of the Rouyn section in that "with few individual prospectors holding the ground, the prospecting would be incomplete and haphazard."

It may interest your readers to know that several company "field scouts" actively participated in the snowshoe staking of last winter. In one instance two scouts staked over 40 claims, some 8,000 acres yet their companies allowed all but three or four of these claims to lapse. Most of these claims held for nine months without any field examination or assessment work, were dropped after a cursory office inspection. Surely such procedure by technical men is not conducive to the opening up of a new district!

The above staking, however, was done last winter before the era of technical disapproval. Notwithstanding the publicity given to "claim hogging," various mining engineers in the last six weeks have staked a large number of claims for their respective companies here in the Rouyn district. In several instances, in their eagerness to acquire ground they even went so far as to attempt to stake claims already located by bona-fide prospectors. One engineer deliberately cut a prospector's name from the claim posts. Unfortunately, such would-be claim jumpers cannot be handled as they would have been in the early days of the West.

As far as we can see (and we believe we voice the sentiments of the prospectors as a whole) this talk about the prospectors' staking by the technical men is merely a sort of "smoke screen" to cover their own activities. In connection with the above, they strongly urge the retention of the 50-cent per acre tax; (some even go as far as to advocate a $1.00 tax) in order to prevent the prospectors from holding any ground in Quebec.

These company officials rightly figure that the prospector's only capital is his time, while their resources, the cash surpluses earned from the mines found by the prospectors) are large. No wonder the prospector is approaching extinction.

Rouyn Township, Quebec. Fred W. Thompson.

Old Nick's Own Metal

The following resumé of the discovery and development of the vast ore-deposits of the Sudbury nickel range is based on information supplied by Mr. Thos. W. Gibson to the Engineering Foundation, New York, who have published it as Research Narrative number seventy.

In superstitious "Middle Ages" troubles were ascribed to unfriendly fairies and gnomes. Saxon miners having difficulty with certain copper ores blamed Old Nick and called the unknown troublesome ingredient kupfer-nickel, the evil spirit in copper. Nickel in old Saxon meant an obstinate person. Bactrian (province of ancient Persia) coins of 235 B. C. show by modern analysis 20 per cent. nickel. Chinese, centuries ago, used an alloy containing nickel which they called paktong (peck—white and tung —copper). It was resonant, bright in appearance and resisted corrosion well. Many gongs were made of it and it was exported to Europe. Not until 1751 was nickel isolated as a chemical element and given the old Saxon name by Cronsted, a Swedish metallurgist.

Nickel-bearing ores are found in various quarters of the globe, the greatest deposits of all, in the Sudbury district of Ontario province, not being recognized until a generation ago. They are huge "lenses" of mixed pyrrhotite and chalcopyrite and now produce 80 or 85 per cent. of the world's supply of nickel.

In 1856, a Canadian Government surveyor, Salter by name, while running a meridian northward from Lake Huron past Whitefish Lake, noted that at certain places his compass was deflected ten to twelve degrees more than the normal deflection. He reported this incident to Murray, a government geologist, who found magnetic trap rock containing traces of nickel, but did not suspect that he was walking over the greatest deposit of nickel ore in the world, so far as has yet become known. Nickel was not then in general use or in great demand. At any rate the casual observation of indications in an inaccessible wooded wilderness excited no enthusiasm among prospectors.

Grading for the Canadian Pacific Railway in 1883 revealed the mineral wealth of the region. Thomas Flanagan, blacksmith in the construction gang, noticed an area on the right-of-way covered with gossan (decomposed rock, usually reddish, owing its color mostly to pyrites). He dug holes and found copper sulphide. When railroad building progressed to this spot, a "cut" exposed the deposit. Thomas Murray and his brother William purchased the "lot" of land in 1884, but sold to H. H. Vivian and Company, of Swansea, Wales, who started the "Murray Mine" in 1889 and a furnace in 1890. Vivian and Company quit operations in 1894, selling the property later for $75,000 to J. R. Booth and M. J. O'Brien. They prospected with diamond drills and revealed a very large body of ore, subsequently estimated at eight or nine million tons. These owners in turn sold to the British-America Nickel Corporation, Ltd., which has worked the property on a larger scale. The first smelter was built in 1888 by the Canadian Copper Company, which added a second the following year.

Copper ore exposures in railroad cuts attracted many prospectors. In three or four years they located most of the important bodies yet found. Among these finds the magnetic deposit noted by Salter and Murray in 1856 was rediscovered and has become the Creighton mine, pronounced the greatest nickel mine in the world. It is operated by the International Nickel Company, successor to the Canadian Copper Company. Of the large number of mines the Vermilion arrests attention because first worked as a gold mine. In 1902, an assay showed 4 ounces of silver, 4 ounces of palladium, 1 1-2 ounces of platinum, 1-3 ounce of gold per ton and the nickel and copper contents unusually high. This deposit, however, is small.

Not until 1887 was nickel recognized in the Sudbury ores, although that is the element which has contributed most to their value. What the geologists and assayers failed to detect was perceived by the smelters. Difficulty in smelting a shipment of ore in the Orford Copper Company's works, at Constable Hook, New Jersey, led to the detection of the nickel in the company's laboratory. S. J. Ritchie, President of the Canadian Copper Company, and R. M. Thompson, President of the Orford Copper Company, happened to be in the laboratory when the discovery was made that their troubles were due to the ancient evil sprite of the Saxon miners. It was unexpected news to both men. They found that they had a great nickel deposit instead of a great copper deposit, or more correctly a great nickel and copper deposit. This discovery changed the whole situation.

Advance of the arts and sciences since 1856 has vastly increased and diversified, the demands for nickel, and this development continues. These uses range from coins, the nickel-plating of a great variety of objects, and solid nickel cooking utensils to nickel alloy steels for armor plate of battleships and important members of great modern bridges. Nickel-silver (formerly German silver) is a well known alloy of nickel, copper and zinc. Monel metal is an alloy of nickel and copper, made from the matte (an intermediate, impure product in the process of smelting) without previous separation of the metals. In North America the International Nickel Company is the greatest producer.

NICKEL ZINC

One of the many new forms in which nickel is now used is nickel zinc, made by the Apollo Metal Works, La Salle, Illinois. A brightly finished nickel plate is put on one side of sheet zinc, to which it adheres with an unusual degree of tenacity, so that bending or hammering do not cause it to peel off. This will extend the uses of both sheet zinc and nickel, particularly in the household.

HANDY MAN

An inmate of a certain penal institution recently received a call from the warden, who said:

"I understand you got in jail on account of a glowing mining prospectus."

"Yes," admitted the gentlemanly prisoner. "I was quite optimistic."

"Well," continued the warden, "the governor wants a report on conditions in this jail. I want you to write it" — Harper's.

It is expected that the McGill University exhibit for the British Empire Exhibition next summer will be ready to ship to London by the middle of January.

STORY OF THE SOUTH AFRICAN PLATINUM FIND

Mr. Max Baumann's story of the platinum find north of Pretoria, as told by himself to the members of the Chemical, Metallurgical and Mining Society of South Africa, was reproduced in abstract, in the "Journal" of December 7th. Here is the story as recounted by an on-looker, from the "S. A. Mining & Engineering Journal":

One of the most amazing discoveries in South Africa —that country of ever-fresh wonders — has slowly crept into public notice. No large headlines in the papers heralded the marvellous development which is quietly taking place in the mining world. The public has been deluded too often by the cry of platinum, and when it was stated to have been found in the obscurity of the Northern Transvaal — that hinterland populated by voortrekkers, takhaars and ragged, yet confident, prospectors — the news was received with smiles of derision. Fortune, that elusive sprite, had been so often all but in the grasp of Dolf Erasmus, who is locally supposed to have found every other mineral but platinum, therefore the old fable of "Wolf, wolf," was again proved to be true.

Early in July whispers went round Naboomspruit to the effect that the intrepid prospector of the hills had announced a new and amazing discovery, but this had occurred so constantly since the collapse of the Doornhoek tin mines that little notice was taken of it, and the sanguine, who put money into the affair, were considered insane by the more cautious. Mr. Dolf Erasmus discovered the Doornhoek tin mines sixteen years ago, and for his share received £15,000, but this was unfortunately lost, as he invested it in a farm and stock and, when tick fever devastated the country, his cattle were swept away and all his fortune with them. However, with true voortrekker courage, he was undaunted, and determined to reinstate himself and his family. He was backed by Mr. Max Baumann, a former associate at Doornhoek, and has been seeking for gold for the past four years.

One day, while panning for that metal, he came across unfamiliar traces of a silvery looking substance; this he tried to smelt on his forge, and when unsuccessful began to realise his extraordinary luck. He was not excited, but went on quietly with his quest, and, as soon as certain, conveyed the news to his friends in Johannesburg, together with the samples for their assays. He knew without their proofs that he had stumbled on an incredibly rich lode of platinum. The first revelations of 107 oz. to the ton have already been discussed, but it was thought too good to be true, and the sceptics suggested that "it should not be piled on quite so thick," even then thinking the figures meant 107 dwt. to the ton.

It is strange that Dolf Erasmus has lived on the farm Rietfontein for the greater part of his life, as he came there as a boy 30 years ago with his parents, who were previously farming at the Cape. He knows the place so well and has such a considerable knowledge of mineralogy that fate has played him a wayward trick in denying him access to the treasure so long

What the proximity of this rich lode to the little dorp of Naboomspruit is to mean to that small place can hardly yet be realised. We dreamers visualise a meteoric rise comparable with that of Johannesburg and other large mining centres. When the new road is made, the distance from the mine to the station will only be about six miles; at present a circuitous route is adopted, and the scenery on the way is exceedingly beautiful. Unless the railway extend a side line into the hills, Naboomspruit must always be the headquarters and is well adapted to its future expansion. The site is flat, but very picturesque with its large bushveld trees, and the climate is not intolerably hot in the summer. The township has already been laid out into wide streets and avenues on the American plant, and plots have doubled in value lately.

FURTHER PLATINUM REEFS REPORTED IN THE TRANSVAAL

On December 7th we published an account of some length of the new platinum discovery near Waterberg in the Transvaal, north of Pretoria. The following, from the "S. A. Mining & Engineering Journal", gives later news:

The public interest in the platinum discoveries of the Waterburg district is growing stronger every day. There are continual reports of new lode discoveries in this district at distances very far removed from the area where the deposit was first located. From Nylstroom northwards for 50 miles the lode, or at any rate, a similar lode to that found on Rietfontein No. 3, has been traced, while to the south-west of the area the same lode formation extends for many, many miles; the most recent instance being its discovery on the farm Verloren No. 2026, about three miles from Waterberg Siding. Here the outcrop is very well exposed over a long distance, the lode matter exactly corresponding to that of the Rietfontein formation. The strike is also very persistent and is quite easy to follow right across the farm. Here, again, the dip is slightly south from the vertical and makes another corresponding feature to that of the Rietfontein deposit. Quite an army of prospectors and fossickers are roving all over the Waterberg district to-day, and one may expect to hear of a number of similar discoveries in other places. It may be as well here to give a word of warning to some would-be geologists and engineers who, in their zeal for discovery of platinum lodes and due largely to their ignorance of the general and particular characteristics of this formation, are apt to mistake our old friend the Ventersdorp series for the platinum formation.

And now as to its possible extent. It would appear that the lode extends for, probably, one hundred miles north-east and south-west of the Rietfontein outcrop. It varies in direction in places due to disturbing influences which are quite obvious to the initiated, but the general direction is maintained throughout. Similarly as regards the dip, this is practically vertical everywhere. The [illegible] nature of the walls is a feature which must not be overlooked by the prospector, as this constitutes a distinguishing mark of the lode. There is a considerable amount of prospecting work going on over a wide area, and one may expect to hear of finds in places very far removed from the point of the original discovery. One such has been located over 100 miles away from Rietfontein No. 3. Samples of the formation have been assayed and show values up to 15 dwts. of platinum to the ton; but it cannot be too strongly emphasised that the whole value of the deposit still remains to be proved, and that no real mining has been attempted over most of

the area held by the different syndicates. Still, what little is known of the ore contents of the lodes is very favourable, and sufficiently encouraging to warrant further development of the propositions. After all, the proving of such a huge area will be a matter of years, and cannot possibly be determined in a few months either way.

We badly need new fields of mining in South Africa to-day. The country is rich in minerals of all kinds; this is a truism which needs no arguments to support it. There are many willing workers who want occupation and who otherwise will go to the wall. We cannot afford to pass by as worthless any possible field for development, and where the initial work already done is such as to prove a possible new mining area it ought to be, and, indeed, must be prosecuted with all the energy at our command, so as to make room for the white people of the Union to live and thrive in the land of their birth or adoption.

IMPERIAL OIL'S EXPLORATION

The Imperial Oil Company's recent progress and plans for the future in the West are summarized in the current issue of *Agricultural and Industrial Progress in Canada*, the organ of the Canadian Pacific Railway, thus:

Work on the new refinery of the Imperial Oil Co. at Calgary, Alberta, is proceeding rapidly, and by the time this article is in print will doubtless be fully ready for operations. Over 1,000 men are employed in the construction, and already there are approximately 50,000 barrels of oil in storage for refining. Future movement of "crude" to the refinery will probably come from the Wyoming field unless greater developments take place in the Southern Alberta field.

It is reported that Vice-President McQueen, who is in charge of production, has stated that the Imperial Oil Co. will not suspend operations in the Canadian North-west, and that it was the present intention of the Company to send in at least one crew to the Fort Norman with a view to deepening the Discovery Well or sink a deep hole alongside it. It is possible that work will be continued on the well at Blue Fish Creek, which is down nearly 500 ft., but which was left alone this season for lack of drilling crews. Two other wells in the district are understood to have been abandoned.

One of these, known as "C," was bored to a depth of 3,057 ft. in limestone but without a satisfactory showing; the other, "D," was drilled on Bear Island to a depth of 2,080 ft. A showing of oil was encountered at 1,945 ft. and further indications of oil and gas at 1,975. Below that, however, a small quantity of salt water was encountered.

The Discovery Well was deepened to 951 ft. and is capable of producing between 60 and 70 bbls. per day.

A new well will probably be sunk beside it next year as the original hole was too narrow to permit its easy deepening.

The Grattan or Irma No. 2 well is practically finished. Work is also in progress at the old Dingman property near Okotoks, where two new gas wells are being sunk by the Royalite subsidiary. Well No. 3 is down approximately 3,000 ft. and is reported producing 5,000,000 ft. of gas per day.

The Imperial Co. is enlarging its compression plant at Royalite to permit additional gas to be piped into Calgary, to which city it intends to supply 6,000,000 ft. of gas per day.

Work is also in progress on the Rogers leases, in which the Company holds substantial interests. These are located about four miles north of the international boundary and some twelve miles east of Coutts. Indications there are said to be encouraging.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

Toronto Meeting, 1924

It has been decided to hold the 1924 meeting of the British Association for the Advancement of Science in Canada. The sessions will begin at the University of Toronto on August 6th. and will last for one week. Following the sessions the chief excursion will be that to Western Canada and the Pacific Coast, going out by the National Railways and returning by the Canadian Pacific, or *vice versa*. Another excursion will cover the chief mining areas, pulp and paper plants, and so forth, of Northern Ontario. During the sessions there will be a number of shorter excursions, such as one to Niagara Falls and other areas of interest in the Province.

This will be the fourth Canadian meeting of this important Association, the first having been held in Montreal in 1884, the second in Toronto in 1897 and the third in Winnipeg in 1909. Only two other meetigs of the Association have been held outside the British Isles, viz., one in Australia and one in South Africa. The Association represents all branches of science; those that will be of most interest to mining men are the Section of Geology and that of Engineering.

The first annual meeting of the Association was held in 1832; this makes the Association one of the oldest, as well as one of the most influential, of scientific societies. It is expected that four or five hundred members will attend the Toronto meeting frrom overseas. There will also be a considerable attendance from the United States and, of course, from Canada. The Toronto local Secretary's Office is Room 50, Physics Building, University of Toronto.

POSITION OPEN IN MINES BRANCH

Applications will be received by the Civil Service Commission, Ottawa, up to January 3rd, 1924, for the position of Engineer in the Division of Fuels and Fuel Testing of the Mines Branch, Department of Mines. The initial salary is $2,700 per annum, to be increased by $120 annually up to $3,180. The duties are, under direction, to plan and carry out experimental tests on the combustion and carbonization of fuels and their products; to co-operate with the Technical Engineers and Chemists of the Division on the assay and valuation of solid, liquid and gaseous fuels; to inspect commercial equipment for the efficient burning and carbonization of fuels, and to design, build and operate experimental fuel testing apparatus; and to perform other related work as required.

The qualifications required are:—Education equivalent to graduation from a university of recognized standing with specialization in chemistry; preferably graduation in chemical engineering; at least four years' experience in commercial or research work connected with the Canadian industries of fuel combustion and carbonization, two years of which shall have been in a position of professional responsibility; familiarity with research methods and practice; ability to prepare for publication the results of investigations; initiative, good judgment; ability to handle men; good physical condition.

Mineral Constituents of Rand Concentrates*

By A. R. COOPER

Metallurgical practice on the Witwatersrand has recently turned from the method of removal of free gold from the ore by means of amalgamation, to the attainment of the same object by a preliminary concentration on corduroy followed by a further cleaning of the concentrate by one or more pasages over a table of the Wilfley type. The ultimate concentrate may then be treated with mercury to recover the gold, osmiridium being obtained from the tailing after barrel amalgamation and before final cyaniding or other treatment to recover the gold which may have escaped amalgamation. In the absence of osmiridium the gold may be cleaned sufficiently to allow of direct smelting.

From the inception of corduroy and Wilfley concentration it became apparent that the concentrates were often very far from being the simple mixture of gold, quartz and pyrites that association with ordinary ore samples or even black sands has led us to expect. We have long known from examination of rock specimens that occasionally pockets of such minerals as zinc blende and galena occur in the reef, the latter material being sufficiently heavy to accumulate in concentrates, but visual examination of picked specimens naturally fails to indicate the presence of minerals, which even ordinary methods of analysis would hardly reveal in unconcentrated material. Minerals occurring in the reef in such minute quantities that they have appeared to be of only slight scientific, and of no practical interest, have suddenly become important constituents of the very considerable quantities of concentrates which we handle daily. Osmiridium, once regarded merely as a special curse visited upon assayers, is now of real economic interest.

Cobalt-Nickel Arsenide

I am afraid that other minerals, which I will discuss, are quite capable of taking the place once occupied by osmiridium as a curse, not only of assayers but also of metallurgists. My first experience of one of these minerals was a sample taken from one of the mines of the Far East Rand; it was first noticed on the Wilfley tables just below the gold, and was christened the "Blue Streak". Later an enthusiastic investigator brought in a large quantity of the material with the claim that it was osmiridium, and could be obtained from one mine at least in bucketsful! It proved, however, to be an interesting arsenide of cobalt and nickel, mixed with galena and pyrites—a fruitful source of trouble and expense during smelting operations, where its habit of producing matte and speiss, the former rich in silver and gold, and the latter in platinum metals and gold, is most undesirable. It is probably also a cause of much of the coated gold and sickened amalgam met with during barrel amalgamation, especially when the material is ground to an impalpable pulp before adding the mercury. Some of this arsenic dissolves in cyanide solutions, is precipitated on the zinc and appears in acid-treated gold slime, which therefore, requires very careful roasting.

We have often listened to very interesting papers on the treatment of arsenical ores without quite realizing, I think, that we may be handling them here. I have a bottle of this arsenical concentrate for your examination, and you will notice its bluish white colour when compared with the sample of pyrites concentrate and understand how easily it can be mistaken for osmiridium.

The analysis of the material is as follows:—

	Per cent.
Arsenic	23.6
Cobalt	11.4
Nickel	3.6
Sulphur	23.7
Iron	22.8
Lead	6.8
Gold, Silver and Platinum Metals	8.1

This analysis corresponds to the mineral composition:

	Per cent.
Pyrites Fe S_2	42.3
Cobalt-Nickel Fe S_2 Iron Arsenide (Co Ni Fe) As	41.7
Galena PbS	7.9
Gold and Osmiridium	8.1

The arsenide therefore has the composition:—

	Per cent.
Arsenic	56.6
Cobalt	27.4
Nickel	8.6
Iron	7.4

This is an usual mono-arsenide corresponding to the mineral Niccolite (Ni 43.9 per cent., As 56.1 per cent.), and I cannot find any reference to an occurrence in which cobalt predominates. The galena is present commonly as very perfect crystals of cubo-octahedral form. Occasionally a small amount of the arsenic is replaced by antimony: bismuth may also be present. This material appears to be present in some quantity throughout the reef, but so far as our present information goes it is very much more plentiful in those mines east of Benoni—the Far East Rand—than in any others.

Uraninite

Another extremely interesting mineral is found in the heaviest concentrates in many mines of the group extending from the Boksburg fault west to the Central Rand: up to the present investigations have not been carried out on concentrates from the more westerly mines. This mineral is a variety of Uraninite, and a concentrate carrying a large proportion of it is shown here. It has the black colour and brilliant lustre of polished jet, and the concentrate is of the following composition:—

	Per cent.
Uranium Oxide	19.1
Thorium Oxide	1.6
Cerium Group Oxides	0.2

* From a paper read before the Chemical Metallurgical and Mining Society of South Africa.

Yttrium Group Oxides	1.5
Tellurium	Present, not determined
Calcium Oxide	Traces
Magnesium Oxide	3.3
Bismuth Oxide	0.2
Silica	1.4
Combined Water and Gases (by difference)	3.5
Aluminium, Manganese, Phosphorus, Vanadium	Traces
Copper Oxide	0.5
Lead (Pb)	8.1
Sulphur	1.1
Iron	5.0
Arsenic	5.9
Cobalt	2.3
Nickel	1.4
Gold	6.6
Mercury	2.2
Platinum and Osmiridium	4.5
Zircon	1.6
Radium	142 milligrams per ton

The radium is calculated from the ratio U: Ra is 1 :3.4x10 (Lind and Roberts, 1920); the gases helium, argon and nitrogen have not been determined. It appears that the whole of the lead is present as galena, and the cobalt, nickel and arsenic as the mineral previously described; the latter can be separated by chemical means. Mercury is probably present as small particles of amalgam not yet completely eliminated from the milling circuit. It is uncertain at present whether the bismuth is a constituent of the uraninite or not; as some evidence points to the likelihood of more bismuth being present in some concentrates than the above analysis would allow for. On one mine in the Central Rand it was noticed recently that, as the bars of mill gold solidified, they extruded some bullion in a moss-like form.

This extruded material proved to contain the following:

	Per cent.
Gold and Silver	76.0
Lead	18.4
Bismuth	4.3
Arsenic	0.8
Iron	0.2
Copper	0.3

This very easily fusible aloy, while still liquid, had been forced out by the solid and contracting gold, but it is too much to expect that it had all been so conveniently ejected and the bar of gold would be segregated and practically impossible to sample—thus providing an awkward problem to the unsuspecting official who had the task of reconciling mine and refinery assays.

Tellurium

Among the constituents of the uraninite concentrate is a small amount of tellurium. I have separated some in the metallic form, but it is very difficult to determine quantitatively owing to the extreme complexity of the concentrate. The six platinum group metals interfere with its estimation, forming the complex sulphocyanides mentioned as newly-discovered compounds in a recent abstract in the Journal, while when mercury is also present a number of very curious reactions are obtained. It appears, nevertheless, that the tellurium is present in combination with gold. A number of fairly obvious inferences can be drawn from this, such as losses of gold during assaying, but I do not think that this is likely to be serious, unless local concentrations of the telluride occur somewhere, and I do not wish to exaggerate the importance of the tellurium.

Radium

It would be interesting to purify the uraninite by mechanical means—probably flotation would separate sulphides, arsenides and metals from the oxide—and ascertain the true constitution of the pure mineral and its radioactive value. Some samples of pitchblende have five times the activity of the radium contained, though the U: Ra ratio is constant. As the concentrate shown here contains approximately 142 milligrams of radium per ton, and the world's radium consumption is about 25 grams per annum, it would require about 200 tons of concentrate to supply the demand, presuming almost complete recovery. However, this is probably not a practical line. I only mention it as interesting statistics. Possibly another suggestion may be placed in a similar category— that our ventilation experts might consider placing a quantity of this concentrate in front of the ventilating fans and then determine the ionisation of the air in different parts of the mine to determine percentage air delivery to any given point. A preliminary survey of natural ionisation of the mine air due to radioactive matter in the rock would be necessary. An auto-photograph made by the uraninite in 24 hours is shown—the fainter initials at one side were made by thorium oxide recovered from an East Rand concentrate.

List of Constituents

The following is a list of elements which have so far been proved in reef and concentrate samples: Aluminium, antimony, arsenic, bismuth, calcium, carbon, cerium group, chromium, cobalt, copper, gold, hydrogen, iridium, iron, lead, magnesium, manganese, nickel, osmium, oxygen, palladium, phosphorus, platinum, potassium, radium, rhodium, ruthenium, silicon, silver, sodium, sulphur, tellurium, thorium, titanium, uranium, yttrium group, zinc, zirconium. I think that we can take as read some thirty-eight known radio-active substances, which we must presume to be present. But the gases helium, argon and nitrogen could safely be added to the list. Practically all these elements are present in quite appreciable quantities in some of the usual concentrates.

Rare Earths

It is interesting to know that some of the rare earths (thoria, ceria, etc.) occur in more than one mineral found in the reef. Sometimes very considerable amounts in acid-soluble form are found even in the absence of uraninite, and also there may be forms insoluble in any acids, but decomposed at a good red heat by fused bisulphate. The compounds of cobalt, nickel, arsenic, chromium, titanium, uranium and rare earths shown here have all been prepared from samples of concentrate received at various times from reduction works—their origin is their only novelty, but the quantities shown will impress you with their comparatively high concentration, as in each case the material was obtained from only one batch of material dissolved in the laboratory in the ordinary course for gold or osmiridium recovery.

Since writing the above, I have received an interesting specimen of "Millerite," or "Capillary Pyrites," taken from a cavity in the reef on the Far East Rand. This is practically pure nickel sulphide.

HOLDINGS IN SOUTH LORRAIN OF NEW RHODESIA MINES & INVESTMENT CO.

At the annual meeting of this company in London on November 30th, one of the directors. Colonel Ralph Cobbold, dealt at length with his impressions of mining in Canada, and in particular of the South Lorrain district, where the company had acquired interests. In the western portion of the district, which particularly interested the company, there existed probably the richest patch of ground in the world. From south to north there were the Lorrain Trout Lake Mining Co., the Keeley, the Frontier, the Belle Ellen (in which this company had an important interest), and the Taylor-Conkey areas. The Woods vein ran from the northern end of the Trout Lake to the north through the Lorrain, Trout Lake and Keeley properties, and then through a long line of properties owned by the Mining Corporation of Canada, for the best part of two miles to the north. This Woods vein was yielding high-grade silver ore in all properties that had been developed. The Belle Ellen claim lay east of the Woods Vein, approximately 200 yards from it; the general dip was east towards the Belle Ellen at an angle of about 65 degrees. The claims R. L. 455. and 456, in which also the company was interested, lay some 500 yards west of the Woods Vein or fracture. This fracture was broken by cross-fractures running east and west, in one of which (vein 26 in the Keeley property) phenomenal values were discovered last year. Vein 26, if it continued, would probably cross R. L. 455: it was heading in that direction. The discovery to which he had alluded was in a length of 74 ft., from which an average of 2,6000 ozs. was extracted over an average width of 15 ins.—over 250,000 ozs. of silver taken out without stoping. Colonel Cobbold went on to allude to the experience of other properties in the neighbourhood mentioned above, and their bearing upon the company's interests. There was no reason why, when the property developed in depth, highly satisfactory results should not be achieved. The surface veins on the Belle Ellen were perhaps stronger than any other surface veins in the district.

The property was pretty well equipped with compressor, with power ready to hand; a shaft was down from 250 ft. and everything was ready for active development. In his opinion South Lorrain was the great centre of interest in the mining world of Canada. It required only a question of time and a judicious expenditure of capital to enable their interests there to make good and ensure a prosperous future for the company.

DOMESTIC COKE FROM SYDNEY

A substantial increase in coke production at the steel plant in Sydney took place last week when the coking period was reduced, thereby giving a larger daily output. Formerly the ovens were operating on a 22-hour schedule, but now this time is reduced to an 18-hour schedule, for all three batteries. Under the new time, the former output, averaging 1,365 tons daily, will be increased to approximately 1,700 tons. The demand for domestic coke is good at present, and in order to supply the trade requirements it has been found necessary to secure a greater tonnage. No. 2 battery, which was recently put in operation, is now giving very satisfactory service, and will continue to improve from month to month. Whatever other departments of the steel plant may be affected this winter by industrial conditions, there is every indication that the coke ovens will be operated nearly to capacity.

CONSOLIDATED GOLD FIELDS OF SOUTH AFRICA IN ONTARIO

In the annual report issued in November of this company, which owns mines on the Rand, in Rhodesia and elsewhere, it is stated that, with a view to obtaining a footing on the ground floor in the Ontario gold territory, the directors have acquired a minority interest in the Porcupine Goldfields Development Company.

NITRATES FROM METHANE

A new process for recovering cyanide compounds from atmospheric nitrogen by using methane or its products of dissociation, has been patented in Germany.

Methane, as is well-known, at temperatures beyond 1,000 deg. C., splits up into carbon and hydrogen of extreme purity. If such carbon be mixed with barium carbonate or formed into briquettes with same, and these heated in a stream of nitrogen to 1,100 deg.-1,300 deg. C., then the nitrogen combines with the barium and the carbon to barium cyanide, from which, after reduction with potassium carbonate, a good yield of potassium cyanide is obtained, with barium carbonate again as a by-product. The latter is uncontaminated with slag and can at once be used to form cyanide.

The heat required for the process is supplied by the hydrogen from the methane, which, upon being burnt with the correct amount of air, yields a mixture of water vapour and nitrogen. Upon the gases of combustion being cooled, the water vapour is precipitated, leaving pure nitrogen behind, which can be used to produce the barium cyanide.

The process would form the basis of an atmospheric nitrogen industry wherever natural gas is available. - Abstract from Technische Blaetter, in Bulletin of the Cleveland Scientific and Technical Institution.

THE STORY OF ASBESTOS

The November and December issues of *Compressed Air Magazine* contain an unusually complete account, in non-technical language, of the asbestos industry of Quebec from the pen of Norman R. Fisher of Consolidated Asbestos. It is a distinct service to the industry thus to set before the general reader the facts about the mines and mills that contribute the larger part of Quebec's mineral production.

METAL MARKETS

(Prices in carload lots, f.o.b. Montreal, as quoted by Consolidated M. & S. Co.)

Average for week ending Dec. 18th

Electrolytic copper	15.00
Zinc	7.80
Lead	7.95

Bar Silver Prices

Average for week ending Dec. 14th

London	33⅛d.
New York	65½c.

THE MINING DISTRICTS

By THE JOURNAL'S CORRESPONDENTS

NORTHWESTERN QUEBEC

Coniagas Mines has a block of 12 claims, aggregating about 2,400 acres, under examination south of Pelletier Lake, in Rouyn township. They were led to examine the group by a promising find on the Spry claim, which is about the centre of the block. According to the present owners, Messrs. Gamble, Bathurst Hoffman et al., a schisted zone 175 to 300 feet wide has been located on the Spry claim. There are stated to be a number of parallel shearings in the Temiskaming conglomerate with intrusive porphyry. Quartz veins and veinlets, from an inch to seven feet in width, carry visible gold, galena, molybdenite, iron pyrite, arsenical pyrites and some undetermined minerals. The strike is approximately east-west, and the dip is 45 to 65 degrees to the north.

Coniagas makes no payments on its option until January, when $1,500 is due. The total consideration is $500,000, with no serious payments coming due for two years.

NORTHERN ONTARIO

Activity in Deloro Township.—Very interesting is the finding by M. J. O'Brien Limited of a gold-bearing vein in the first of a series of drill-holes now being put down on a group of claims in Deloro township, Porcupine. The O'Brien group adjoins March Gold, Ankerite and one of Goldale's several groups. About thirty feet of drill core has indicated a vein width of about 12 feet. Average values were better than $14 a ton. The vein section is in greenstone between two extensiv masses of porphyry that extend in an east-west direction through Deloro township.

Diamond-drilling is being carried on at the March Gold from the 800-foot level, and from the surface. A drifting and crosscutting on No. 1 vein at 800 feet has given low values across widths up to 98 feet.

Drilling is also being done at the Ankerite, and the adjoining Paymaster and United Mineral Lands group. A short distance to the west, on the Edwards property, English interests have installed a mining plant and shaft sinking is under way.

Porcupine. — Coniagas, operating Newray Mines, has changed over its mining plant from steam to electric power and will soon be sinking its shaft to 1,000 feet. The shaft is now at 400 feet. Electric power is being supplied by the Great Northern Power Company from its Indian Chutes plant.

Nighthawk.—Nighthawk Peninsular's mill is being gradually brought up to its capacity of 200 tons a day. It has been intimated by officials that a grade of $10 a ton or better will be maintained.

McIntyre Mine is now approaching Dome's production. Dome's output in November was $380,000 from $10 ore; McIntyre produced $350,000 from $11 ore. McIntyre runs 1,000 tons daily, Dome just under 1,300 tons daily. Dome's average ore content is down slightly, having been from $11 to $12 for a year past. This is due to the unusually large amount of rock from development going into the mill.

There is already a credible talk of enlarging McIntyre's mill, since good widths of ore of a good grade were encountered in several veins on the new low levels. Mill enlargement will come certainly, but the decision of the directorate will await the blocking out of ore in the levels from 1,875 to 2,500 feet. Not much of the material opened below 1,875 is included at present in ore reserves. McIntyre for years paid dividends almost entirely from one vein. Now it has six large veins capable of substantial production.

Kirkland. — Lebel Ore, Lebel Township, is drifting on the 200 foot level on the vein that gave high gold returns in the shaft at 160 feet. The west drift showed commercial grade for only a short distance, but the east drift, now in about 100 feet, has showed what the management describes as good ore.

Northland Gold Mines, owning a large block near the centre of Gauthier Township, east Kirkland district, plans to start shaft sinking shortly. An initial depth of 500 feet is being considered by the management. On this property during the past several months a steam driven plugger drill has been used to open up a number of vein outcrops. While the values found in these veins, eight in number, are not commercial, it is hoped that ore will be found at depth. A small mining plant is being installed.

Boston Creek.—Work on the 350-foot level of the Barry-Hollinger property, has been giving encouraging results recently, though these are not decisive. The schisted country rock adjacent to the gold-bearing quartz veins has been found to carry low values. This property was at one time a producer in a small way, being known as the Patricia.

Matachewan.—Officials of the Sterling Development Company, which has an option from Weldon C. Young on the Davidson property, Matachewan district, state that the first drill-hole has given satisfactory results. Nos. 2 and 3 drill holes are now under way. About 5,000 feet of drilling is contemplated. The Sterling Development company, which is a Toronto concern, turned over its option to the Porcupine Goldfields, an English company said to be backed by South African capital.

Cobalt.—One of the most interesting of recent developments at Cobalt has been the opening up of a shoot of high-grade ore in the Genesee Mine, north of the Chambers-Ferland group. Up to last week 125 feet of drifting showed good ore, from which twenty tons of high-grade has been sorted and bagged. This will probably average 1,000 ounces to the ton. In addition to high-grade, from two to three tons of screenings from the ore-sorting table have been made that averages well over 100 ounces to the ton.

Judging from results in the drift, and based on the expectation that the shoot will have a depth of 60 to 70 feet, the prospects are that a half million ounces will be mined from this shoot. There are several parallel veins still to be explored. The Genesee is controlled by a Rochester group and has been working since 1915. This is the first commercial ore found in the mine.

South Lorrain. — The engineers of the T. and N. O. Railway have placed in the hands of the Commission their report and plans for a branch railway connecting the mines of South Lorrain with the concentrators of Cobalt. The building of this line has not been ordered but it is confidently expected by some of those in close touch with the Ontario Government that construction will commence early next spring. Splendid deep level developments on the various Mining Corporation holdings should encourage this expenditure, especially in view of the fact that the railway would have good freight and passenger traffic from the beginning.

The silver-bearing horizon in South Lorrain has already been proved to be thicker than that of Cobalt, which latter camp has managed to produce $200,000,000 worth of silver from an horizon seldom more than 300 feet thick. Along the Woods fault vein, high-grade silver ore has been encountered over a length of a mile and a half, and for the southerly half of this length it is under intensive development. It is apparent that South Lorrain has several years of profitable life ahead of it. Developments outside the Woods fault, such as that of Canadian Lorrain on the Maidens Creek section, are expected to enlarge the producing area.

The railway from Cobalt would be 18 miles long, and would cost about $30,000 a mile. The engineers favor a route leaving the main line at Cassidy siding, about three miles south of Cobalt, and from there following the course of the Montreal River. This route of the three proposed, also is the one favored by the mine operators.

BRITISH COLUMBIA

Portland Canal. — The Granby Consolidated Mining & Smelting Co., will ship approximately 3,000 tons of ore from the Outsider Mine, Maple Bay, within a few weeks. H. S. Munro, general manager, says that these shipments will start before Christmas and that they will be doubled during the New Year. The concentrator, now under construction, will be finished within two months and the new dam, completed some time ago, is giving satisfaction. The Hidden Creek Mine reserves are sufficient to maintain operations on the present scale for from eight to ten years. From the standpoint of future operations, Mr. Munro is quoted as saying that there is more ahead of the Granby Co. at Copper Mountain than at Anyox. The Granby Co. holds title to timber limits containing from 400,000,000 to 500,000,000 feet of timber, of which some 40,000,000 feet on the Kitsault River, according to government report, is being smoke killed. This timber is to be cut immediately and shipped to the Orient, most of it going to Japan.

Kimberley. — Hon. Frank Carvell, chairman; Hon. Frank Oliver, and other members of the Railway Board of Canada, inspected the Sullivan mine, and the Kimberley concentrator of the Consolidated Mining and Smelting Co., early in December. Another recent visitor at Kimberley was Frank M. Smith, smelter director of the Bunker Hill and Sullivan Mining and Concentrating Co. He was accompanied by Livingston Wernecke, manager of the Treadwell-Yukon Co., operating the silver-lead mines in the Yukon from which 4,000 tons of high-grade silver-lead ore was shipped to the Bunker Hill smelter last summer.

Rossland.—It is reported that the last shipment from the I. X. L. Mine was the richest yet made from that property. On the adjoining group, the O. K., the lesses are reported to be working on a quartz vein that is widening steadily and it is their confident expectation that they will strike rich free-milling ore before long.

Nelson.—The Lucky Jim Mine, Zincton, is reported sold to A. G. Larson and associates, the deal having been negotiated through the Canadian Bank of Commerce at Nelson. Acting as trustee appointed by the Courts, Mr. Larson paid off the first mortgage, sums due the unsecured creditors, and a further substantial payment on the second mortgage. These moneys, it is stated, all were raised out of the proceeds of ore taken from the mine and shipped to the smelter. Mr. Larson proposes extensive development as soon as weather permits. There is no mill on the property, but water power, a compressor, and other equipment are available.

Road Recommended. — George Clothier Resident Government Engineer for the Northern Division, announces his intention of making representations to the Alaska Road Commission with a view to arranging for the co-operative construction of a trail up the Unuk River from tidewater to the head of the river, with branch trails up its two principal tributary creeks, in all totalling about 40 miles, about half of which would be in Alaska. This would open up a promising mineral bearing zone.

Hedley.—The Hedley Gold Mining Co. has sunk a a 100-foot shaft during the past year. The mine now is closed down, but diamond-drilling and repairs to the mill are under way.

Allenby.—At Copper Mountain, recently taken over by the Granby Company, extensive diamond-drilling between known ore bodies has been in progress during the summer. The mine has been put in shape for operation, the mill at Allenby altered and dry crushing machinery housed separately, a new flotation unit installed, and arrangements made to take care of tailings. The railway grade has been cleared. The mine now awaits only a rise in the price of copper to go into profitable operation.

Atlin.—In Atlin district, northern British Columbia, a lode prospect has been opened up on Fourth of July Creek by J. M. Ruffner which is promising. The Engineer Mine has been idle durng the year and, as further litigation is pending, it is not likely to be operated in the immediate future. The placer gold yield for the season, it is estimated, will be 9,000 ozs. and it is becoming apparent that the placer production will gradually diminish with the depletion of the smaller creeks.

SILVER RESEARCH AUTHORIZED

Secretary Work of the Interior Department has authorized the United States Bureau of Mines to initiate its proposed research into possible new uses for silver in commerce and industry and made temporary provision for the work through the release of a portion of the reserve funds within his charge.

The Transvaal gold output for October 1923 amounted to 793,842 fine ounces, as compared with 739,504 fine ounces for September 1923, and 778,169 fine ounces for October 1922.

NOVA SCOTIA

Steel Plant Slowing Down. — The usual seasonal slowing down has taken place at the Steel Works, New Glasgow. The 15-inch mill has been temporarily closed down and the bar mill will also be closed shortly. Eight of the twelve steel producing furnaces are now in operation. Other departments are fairly well employed. Mr. Bischoff, General Superintendent of the steel plant states that at present the Company have few orders on their books, as the steel industry has slumped both in Canada and in the United States; but a general improvement is expected after the New Year. Rail orders are expected from the Canadian National Railways, which may keep the Sydney steel workers steadily employed throughout the winter.

Domestic Coke Sales Growing. — It is stated that the coke department, Sydney, will be busy during the winter on domestic coke, as the demand is growing rapidly. This is good news, as it will provide at least one steady department through specialized effort along new lines. Householders must have fuel under all conditions, and coke is the best fuel available.

Idle Time at Collieries. — There is considerable unemployment at the collieries. It may continue for some time; but we are not alone in this respect. Mr. Andrew Steele, International Board Member, District No. 26, representing President Lewis at the wage conference now going on, states that coal conditions in the United States, owing to mild weather and accumulated coal supplies, are not promising. Many of the largest mines are shut down, throwing thousands of men out of employment. This condition is not peculiar to the American continent just now, for Britain and other European countries are all suffering alike.

An Appeal to Government. — The following appeal has been made to the Premier Mackenzie King by Silby Barrett, President of District No. 26, United Mine Workers. Other resolutions of a similar nature were passed and forwarded to the Government by the different Locals.

"Hon. W. L. Mackenzie King, Premier of Canada, Ottawa.

"I beg to place before you the matter of the unemployment at Nos. 2, 4, and 6 collieries in the Glace Bay district; No. 3, Jubilee and the Princess at Sydney Mines, and No. 16 colliery at New Waterford. All those mines are working only two days per week, and at some weeks, no time at all is worked. Those mines employ about 4,600 men; most of them have large families depending upon them. Those families are in destitute circumstances, and it is our opinion that the government of Canada should make arrangements to take coal from these mines, so as to relieve the unemployment situation, instead of buying coal from the non-union coal operators in the United States. These men are entitled to a living for themselves and their families, and it is the duty of the government which is now administering the affairs of the country, to see that something is done to relieve the present situation.

"The Government of this country advocates that the Canadian people buy Canadian made goods, but they do not set this example themselves, for they buy coal from the non-union coal operators of the United States, who are doing more to destroy organized labor, and who are greater tyrants than the German Kaiser, of the Czar of all the Russias ever dared to be. We hope your government will give this matter your earnest consideration, and would request an immediate reply.

(Signed) SILBY BARRETT,
Provisional President,
U. M. W. of A.

Ill-Advised Arguments. — While all are in sympathy with the unemployed at the collieries, we rather think the appeal is weakened by the suggested remedy and the protest against non-union coal operators. Were any one of us placed in the position of Sir Henry Thornton, if we possessed business acumen we would sit down first and count the cost, and then would buy to the best advantage. The whole country is looking to him to put the railways on a paying basis, and he has said it can and will be done. In the meantime, until it is done each citizen of Canada has to pay his share of the yearly deficit in taxes. President Barrett would add to these by un business like methods, for just at the very time when he is appealing to the Government for aid, he is trying to put a wage agreement through that will, if granted, further increase the price of Canadian coal.

Unemployment a Result of the Strike. — Another resolution pointing out that one colliery only worked two hundred and four days up to the sixth of December and only forty-four days in the last three months was forwarded to the Government. If the senders of thse resolutions only stopped to consider the case they would see the ridiculous position they place themselves in before the public, for the foolish July strike is not forgotten and it is well known that because of this strike a contract of over 400,000 tons of coal had to be cancelled, causing a loss of about forty-five full days' work at the collieries, which would have provided steady employment now.

Unemployment at Wabana. — A strong effort is being made to induce the B. E. S. Corporation to provide more employment for the workers in the iron ore mines at Wabana. Four mines are closed and two-thirds of the miners are idle, at a time when alternative employment is difficult to find. Appeals are being made by the government of Newfoundland to Mr. R. M. Wolvin to adopt some means that will give some measure of relief to the large number of men now out of work.

Safety Device Installed. — Lilly Controllers or safety devices to prevent overwinds or run-away cages in shafts are being installed at all the collieries of the B. E. S. Corporation operated through shafts. The device is said to be perfect in action and arrests the flight of a cage without creating another danger just as serious as the one it is supposed to correct. There is no sudden stopping of a cage, but a very gradual slowing up, except at the mouth and the bottom of the shaft. When the cage exceeds a certain speed there are certain mechanisms that begin to spread and that keep spreading until the effect is felt at the throttle, which is closed while at the same time the brakes are put on. In mid-shaft, action is slow, for here the speed of the cage is greatest and the cage must be brought to a standstill very slowly; but at either end, action is rapid. The device is electrically operated, a strong magnet being used, which puts the controllers in motion.

THE SULPHUR AGREEMENT

The present international agreement regulating the sale of sulphur is described briefly and succinctly in a recent report by the United States Geological Survey, thus:

An agreement between the American and Sicilian sulphur producers regulating the world's sulphur market was consummated early in the spring of 1923. The agreement, which applies only to unrefined sulphur, was to hold until September 30, 1923, thereafter to be renewed. The prices will be regulated in relation to the demands for consumption, with an intention of gradually regaining the pre-war levels based on a gold standard, and will be increased by $1 a ton over those temporarily put into effect in October 1922. North America will be supplied by the American producers, Italy by the Sicilian producers, and the remainder of the world proportionately by the two groups, with the provision that Sicilian producers may sell to any country a maximum of 65,000 tons for the manufacture of sulphuric acid. This agreement permits Sicily to export annually 210,000 tons, including 65,000 tons for sulphuric acid, a quantity largely in excess of Sicilian exports in recent years. A central bureau will be established in London to exchange information and statistics between the contracting parties to facilitate the execution of the agreement. The contracting parties are obliged to maintain the present status of the industry so far as the refining and grinding of sulphur is concerned, a provision which amounts to a guaranty of market for the Italian output of worked sulphur. Disagreements arising between the contracting parties will be submitted to a London board of arbitrators composed of a representative of each party and a third agreed upon by these two or in the event of failure to agree by the president of the chamber of commerce. The agreement may be terminated at any time prior to 1926 on not less than six months' notice, except during the sulphur-selling season.

The Texas Gulf Sulphur Co., as part of its contribution to the solution of the problem of finding a market for sulphur, has established a scientific-research department for the purpose of determining new uses for sulphur and increasing consumption.

RESEARCH INTO TRANSPORTATION PROBLEMS

The National Transportation Institute with headquarters in Chicago, has been formed to bring together into a single unit the various transportation units of the United States. In the by-laws it is stated that the object of the National Transportation Institute shall be to conduct non-partisan and impartial investigations and research into every kind of transportation and the relationship of transportation agencies to each other and to Agriculture, Industry, Finance and Commerce and to disseminate the facts thus acquired to the public through the platform, press, educational institutions, motion pictures, and other available mediums, with a definite object of aiding the people of the United States in promoting, co-ordinating and maintaining the most efficient transportation facilities. The Institute shall not in any way become directly or indirectly the representative either of transportation agencies, producers, shippers, or of any special group or groups.

One of the principal activities of the Institute is in the direction of research. It has appointed a research council, and has employed a director of research and staff.

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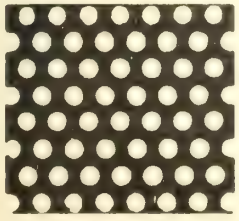

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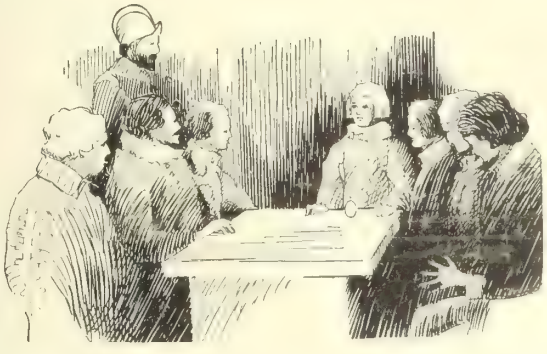

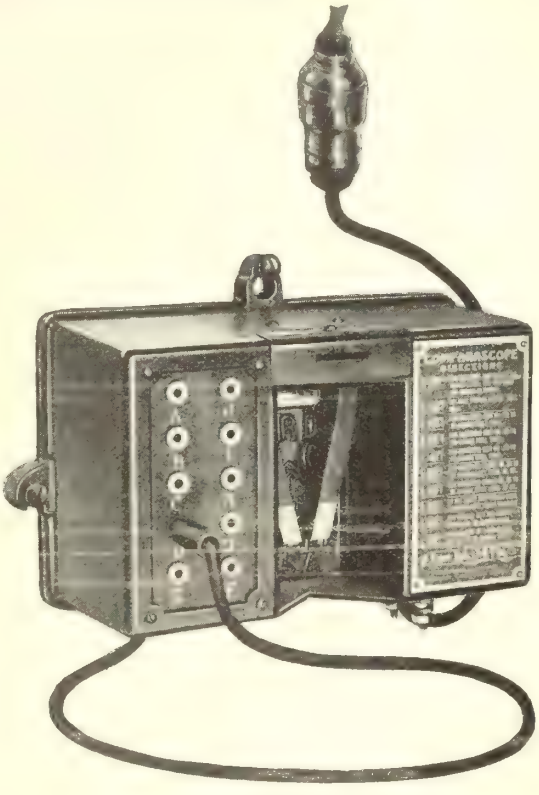

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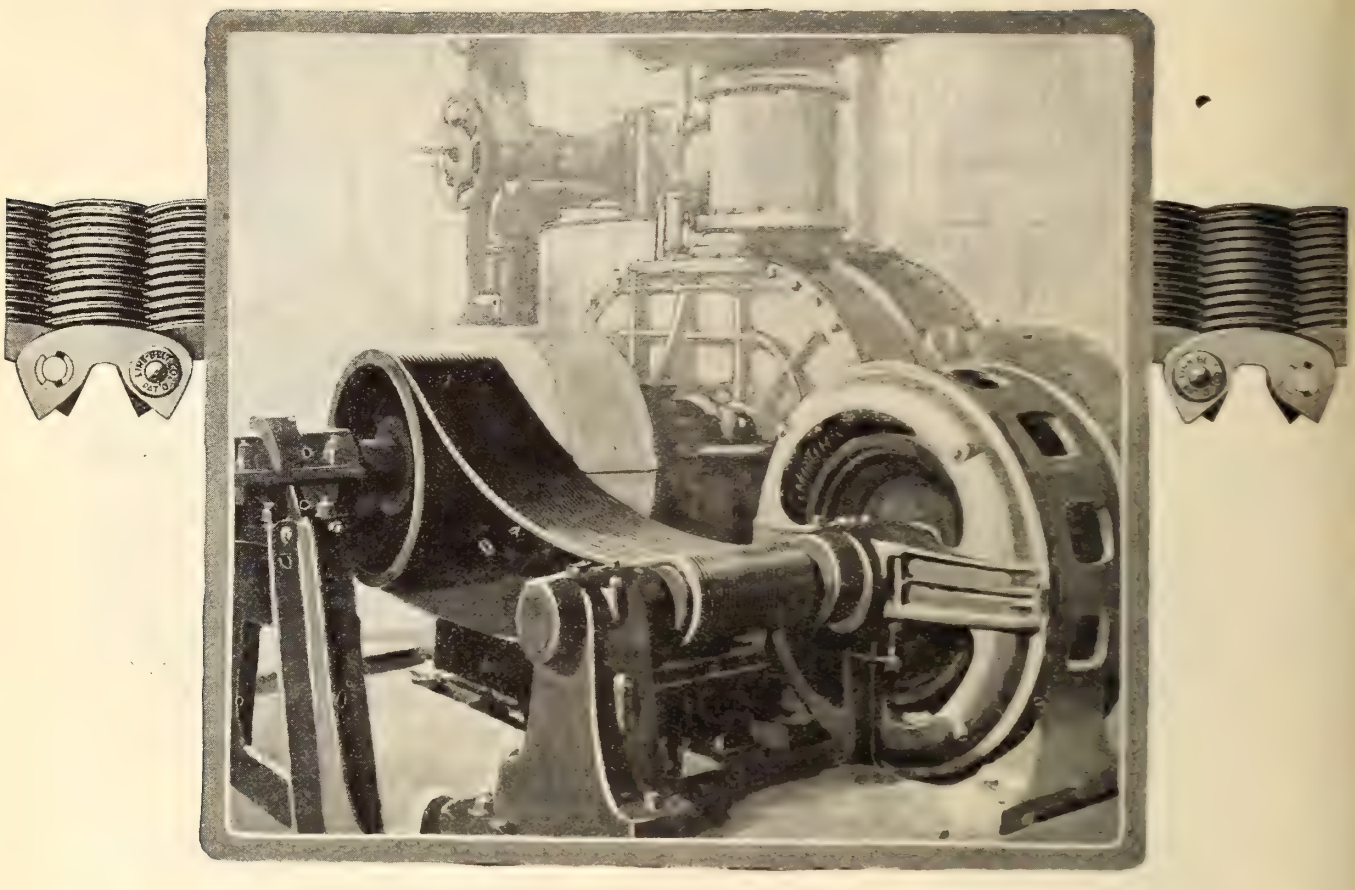

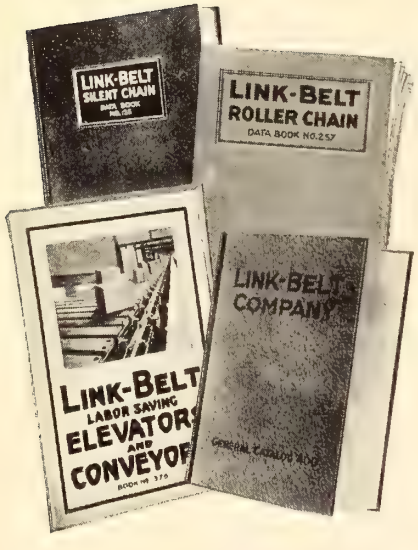

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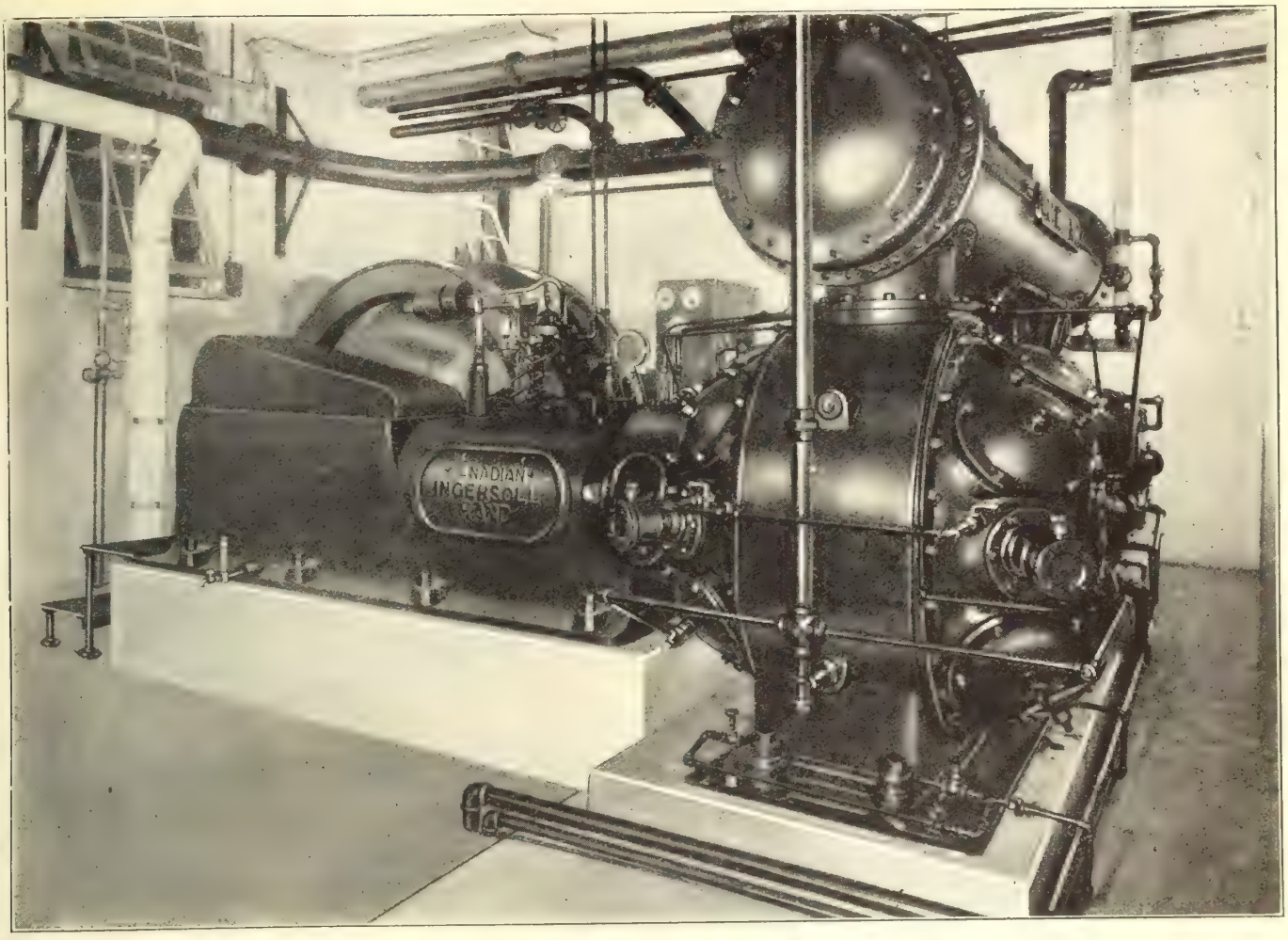

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Few people have had a better opportunity to judge the value of motor-driven compressors in general than the large electrical concerns on this continent who have advocated the use of this type for many years.

That most of these firms have installed Ingersoll-Rand Class "PRE" Compressors in their own shops in the first place, or to replace machines of older types indicates the high esteem in which they are held.

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Many mines, industrial concerns, railroad shops, etc., who have cheap hydro-electric power available, are replacing their older types of compressors with these up-to-date units which provide closer regulation and better efficiencies than any other type.

Bulletin K 317 just off the press describes "PRE" compressors in detail. Write for a copy.

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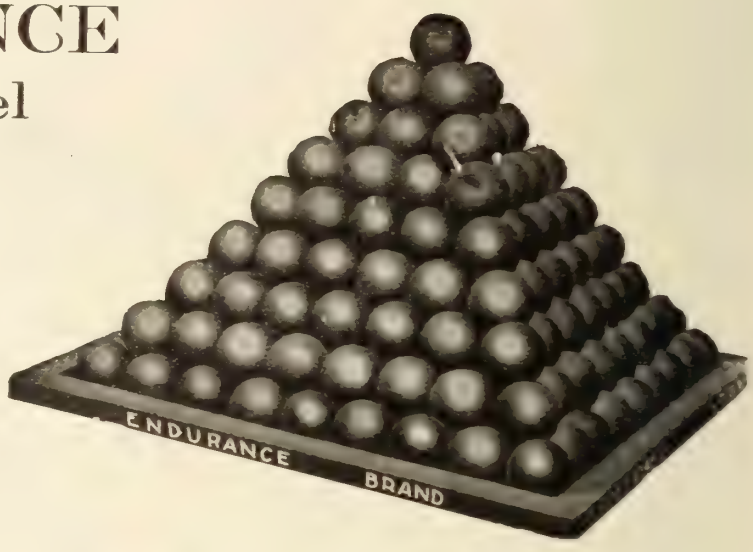

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Ontario's Minerals

PROVINCE OF ONTARIO

Hon. CHARLES. McCREA, Minister. DEPARTMENT OF MINES *Thos. W. Gibson*

Mineral Areas

Ontario, with its 407,262 square miles, contains many millions of acres in which the geological formations are favourable for the occurrence of minerals 70 per cent of the area being underlain by rocks of pre-Cambrian age. The phenomenally rich silver veins of Cobalt, Gowganda and South Lorrain occur in these rocks; so also do the far-famed nickel copper deposits of Sudbury, the gold of Porcupine and Kirkland Lake, and the iron ore of Magpie and Moose Mountain mines.

Economic Minerals

In addition to the above, practically all economic minerals (coal and tin excepted) are found in Ontario: — actinolite, apatite, arsenic, asbestos, cobalt, corundum, feldspar, fluorspar, graphite, gypsum, iron pyrites, lead, mica, molybdenite, natural gas, palladium, petroleum, platinum, quartz, salt, talc and zinc. This Province has the largest deposits on the continent of talc, feldspar, mica and graphite.

Building materials, such as ornamental marble, limestone, sandstone, granite, trap, sand and gravel, lime, Portland cement, brick and tile, meet every demand.

Mineral Production

Preliminary returns show the output of the mines and metallurgical works of the Province for the year 1922 to be worth $62,202,169, of which the metallic production was $38,190,711.

The following figures show the growth of Ontario's mineral industry by five-year periods since 1891 when a Bureau of Mines was first established.

Year.	Value.	Year.	Value.
1891	$4,705,672	1911	$41,976,797
1896	5,235,003	1916	65,303,822
1901	11,831,086	1918 (Maximum war output)	80,308,972
1906	22,388,383	1921	48,128,387
	Dividends.		

Dividends and bonuses paid to the end of 1922 amounted to $28,096,699 for gold mining companies, and $86,238,185 for silver mining companies or a total of $114,334,884.

Mining Regulations

A miner's license costs $5.00 per annum, and entitles the holder to stake out in any or every mining division three claims of 40 acres each. After performing 200 days' assessment work on a claim, patent may be obtained from the Crown on payment of $2.50 or $3.00 per acre, depending on location in unsurveyed or surveyed territory.

Assay Office

The Provincial Assays Office at No. 5 Queen's Park, Toronto, is maintained by the Department of Mines for the free identification of minerals, free assays under the provisions of the Mining Act of Ontario, and also for general assay work as per the Schedule of Charges which may be obtained on application.

Temiskaming Testing Laboratories

The Department maintains, at Cobalt, an ore sampling and testing laboratory which is now prepared to receive parcels of gold ore from 100 pounds upward, and after sampling and assaying the same to pay to the shipper the value thereof, less treatment charges. The purpose is to afford a market for ores extracted by prospectors and others in developing their mining claims, enabling them to obtain funds which they can use for further work and to report on the most satisfactory method of treatment. Fuller information may be obtained on application to the Manager, Temiskaming Testing Laboratories, Cobalt, Ontario.

Publications

For list of publications, illustrated reports, geological maps and mining laws, apply to

Thos. W. Gibson,
Deputy Minister of Mines,
TORONTO, CANADA

BRITISH COLUMBIA

The Mineral Province of Western Canada

Has produced Minerals valued as follows: Placer Gold, $76,542,203; Lode Gold, $109,647,661; Silver, $59,814,266; Lead, $51,810,891; Copper, $170,723,242; Zinc, $24,625,853; Coal and Coke, $238,289,565; Building Stone, Brick Cement, etc., $36,605,942; Miscellaneous Minerals, $1,358,839; Making its mineral production to the end of 1922 show an

Aggregate Value of $769,418,462

The substantial progress of the Mining Industry of this Province is strikingly exhibited in the following figures, which show the value of production for successive five-year periods: For all years to 1895, inclusive $94,547,241; for five years, 1896-1900, $57,607,967; for five years, 1901-1905, $96,509,968; for five years, 1906-1910, $125,534,474; for five years, 1911-1915, $142,072,603; for 5 years, 1915-1920, $189,922,725; 1921, $28,066,641; for the year 1922, $35,158,843.

Production During last ten years, $339,280,940

Lode-mining has only been in progress for about twenty-five years, and not 20 per cent. of the Province has been even prospected; 300,000 square miles of unexplored mineral bearing land are open for prospecting.

The Mining Laws of this Province are more liberal and the fees lower than those of any other Province in the Dominion, or any Colony in the British Empire.

Mineral locations are granted to discoverers for nominal fees.

Absolute Titles are obtained by developing such properties, the security of which is guaranteed by Crown Grants.

Full information, together with Mining Reports and Maps, may be obtained gratis by addressing.

VICTORIA, British Columbia

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PROVINCE OF QUEBEC

MINES BRANCH

Department of Colonization, Mines and Fisheries

The chief minerals of the Province of Quebec are Asbestos, Chromite, Copper, Iron, Gold, Molybdenite, Phosphate, Mica, Graphite, Ornamental and Building Stone, Clays, etc.

The Mining Law gives absolute security of Title and is very favourable to the Prospector.

MINER'S CERTIFICATES. First of all, obtain a miner's certificate, from the Department in Quebec or from the nearest agent. The price of this certificate is $10 and is valid until the first of January following. This certificate gives the right to prospect on public lands and on private lands, on which the mineral rights belong to the Crown.

The holder of the certificate may stake mining claims to the extent of 200 acres.

WORKING CONDITIONS. During the first six months following the staking of the claim, work on it must be performed to the extent of at least twenty-five days of eight hours.

SIX MONTHS AFTER STAKING. At the expiration of six months from the date of the staking, the prospector, to retain his rights, must take out a mining license.

MINING LICENSE. The mining license may cover 40 to 200 acres in unsurveyed territory. The price of this license is Fifty Cents an acre per year, and a fee of $10.00 on issue. It is valid for one year and is renewable on the same terms, on producing an affidavit that during the year work has been performed to the extent of at least twenty-five days' labour on each forty acres.

MINING CONCESSION. Notwithstanding the above, a mining concession may be acquired at any time at the rate of $5 an acre for SUPERIOR METALS, and $3 an acre for INFERIOR MINERALS.

The attention of prospectors is especially called to the territory in the North-Western part of the Province of Quebec north of the height of land, where important mineralized belts are known to exist.

PROVINCIAL LABORATORY. Special arrangements have been made with POLYTECHNIC SCHOOL of LAVAL UNIVERSITY, 228 ST. DENIS STREET, Montreal, for the determination, assays and analyses of minerals at very reduced rates for the benefit of miners and prospectors in the Province of Quebec. The well equipped laboratories of this institution and its trained chemists ensure results of undoubted integrity and reliability.

The bureau of Mines at Quebec will give all the information desired in connection with the mines and mineral resources of the Province, on application addressed to

HONORABLE J. E. PERRAULT,

MINISTER OF COLONIZATION, MINES AND FISHERIES, QUEBEC

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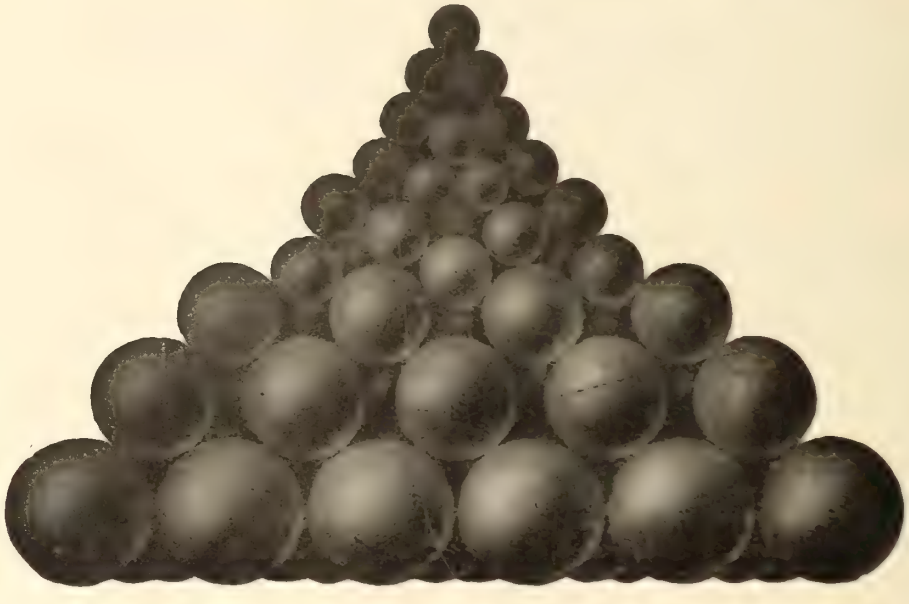

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CANADIAN MINING JOURNAL

PUBLISHED WEEKLY

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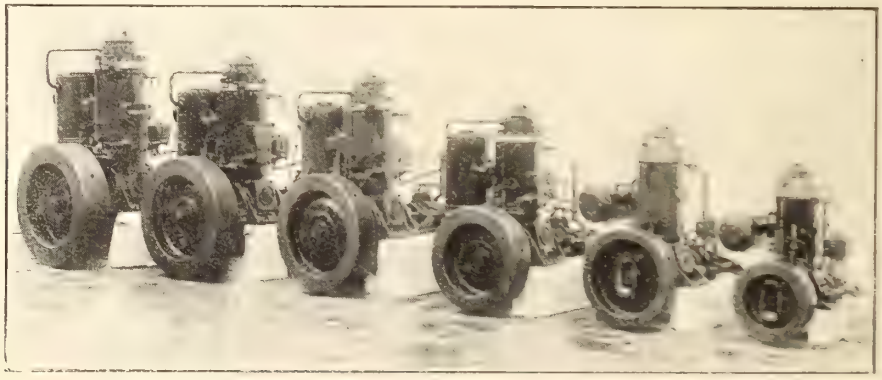

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EDITORIAL

PLACERS IN COBALT CONGLOMERATE

During the eons of time that elapsed between the end of the great Laurentian igneous intrusions and the long Huronian period of deposition, the present peneplain of northern Ontario and Quebec was a surface of jagged mountain ranges, composed of rocks of the Keewatin, Timiskamian and Laurentian series. Erosion was probably more rapid in those days of barren hillsides and precipitate rains, and the enormous amounts of material represented by the beds of conglomerate, quartzite, sandstone, slate and limestone of the Huronian and similar series required less time to accumulate from the débris washed down from these mountains than would be the case under present conditions. The planet was, in all likelihood, without life; even the primordial slime in which the human species had its lowly origin could hardly have existed in the turbulent and impure waters that scoured the hillsides and rushed precipitately into seas on whose beds and margins they dropped their load of silt, sand and gravel. Nevertheless conditions were, in a geologic sense, much the same as they are today.

These mountains of Huronian times were gold-bearing. The wide-spread deposition, (and occasional concentration) of gold that followed the Laurentian intrusions had resulted in auriferous veins and zones, deep buried in the bowels of the hills. At first, none of these were exposed at the surface, but gradually erosion brought them to light, and eventually towards the close of Huronian times, they were exposed much as they are today. Subsequent periods of erosion, such as that which swept away a good deal of the Huronian series before Ordovician times, and the more recent period that was ended with the scouring and polishing of the glaciers, have not had the same profound effect on the topography as that of the great Huronian interval. The peneplain at the end of Huronian times was substantially the peneplain of today.

Gold placers were, doubtless, formed in Huronian times much as they have been during recent times. What a marvellous opportunity there was for the accumulation of the precious metal! Here was an area at least two hundred miles long and forty wide in which nature had stored a fabulous quantity of gold. Even the little outcrops of rock we can see today above the mantle of clay contain concentrations of gold that have already attracted world-wide attention, and this is the merest fraction of what is diffused in unpayable quantities. Within the area of eight thousand square miles there was eventually, we can safely assume, the concentrated wealth of many Klondykes—but no Klondykers to win it.

The question of present moment is whether any of these placers of primitive times can be found today. We believe there is at least a fighting chance. The gravel beds in which they were formed are now conglomerate in the Huronian series. The usual place for the accumulation of placers is on or near bed-rock beneath a bed of gravel. The contact of the basal conglomerate and the old rock surface upon which it accumulated is exposed in numerous places on the southern margin of the gold belt. Round Shining Tree there are some remnants of the Cobalt series, as well as an edge of the great sedimentary area that extends eastward. For twenty miles both east and west of Matachewan there are similar areas where the Keewatin-Cobalt contact may be found. From Englehart northeastward to Larder, and then eastward for twenty miles to the border of Rouyn township, there is another remnant of the Cobalt series resting on the gold-bearing Keewatin and Timiskamian rocks. In any or all of these localities it is possible that consolidated placers may be found in the basal conglomerate.

Up to the present there has been little or no search for these old-time placers; the idea that they may exist and may likewise be found has remained the exclusive property of a few geologists. The idea is worth spreading abroad. It would not be surprising to find, eventually, that the bottom edge of the Cobalt series in the areas mentioned is just as good prospecting ground, on the average, as the adjacent areas of Keewatin and Timiskamian rocks. We should like to have the views on this point of others who have studied the question.

ROADS TO ROUYN

On another page we record the measures taken to ensure the easiest possible access to the gold-field of northwestern Quebec from the south, during both the present winter and the coming summer. The provincial government at Quebec and the Canadian Pacific Railway both realize the potential importance of the present gold development, accompanied as it is by lumbering [illegible] with the large area of excellent agricultural land as the

greatest asset of all, though it will be more slowly developed. Meantime the Temiskaming and Northern Ontario Railway surveyors (or the Nipissing Central, more strictly speaking, for it is under its federal charter the work is being done) is pushing forward its survey eastward along the gold belt from Larder Lake. A road gang is busy on the winter road from Larder to Lake Opasatika, making detours round the worst of the hills and effecting general improvements. The interest in the Quebec gold development on the Ontario side is also reflected in the increased activity in the construction of the Swastika-Kirkland-Larder branch line of railway. A few weeks ago it seemed settled that this line would not be open for traffic until midsummer of 1924. Judging by the activity now to be seen, it will be ready by next spring.

BUREAU OF STEEL MANUFACTURERS

Australia has got another lap ahead of Canada in building up her iron and steel trade. Nature has been good to our sister Dominion, and has provided in abundance the raw materials required for a large iron and steel industry. A number of plants have been erected during recent years, and most of them have been successful, in spite of acute labour troubles. Now success is made still more certain by the inauguration of a Bureau of Steel Manufacturers, whose stated object it is to forward the common interests of all its members.

The new Bureau's organization and proposal activities are not merely experimental. They are along the lines of similar bureaus or federations that have helped British manufacturers so much during recent years. The separate companies have much to gain and can lose little by entering such an association.

Periodically we have pointed in these pages to the fact that the iron and steel industry in Canada has no central organization. Its units, large and small, have no means of organizing or conducting a plan of concerted action, outside of the Canadian Manufacturers' Association, whose interests are far too broad to serve the purpose. Each unit of the industry goes its own way, mainly irrespective of the rest. Questions that affect the whole industry are either left in abeyance or are tackled piece-meal, with the result that little is accomplished.

If ever there was a country that needed a well organized iron and steel industry, it is Canada. The problems confronting the industry are of prime importance and are pressing; they need not be recounted here. The advantages of concerted action to solve these problems are obvious. The effectiveness of combined effort has been shown so often that it does not need added proof.

Though the interests of our various iron and steel plants are not identical throughout, there are a number of rallying points round which they can gather. The sooner they get together to study and attack their common problems, the better will they be able to cope with the peculiar difficulties that will always beset the manufacture of iron and steel in Canada.

THE LARGEST GOLD MINES

Today we print some items from the annual report of the New Modderfontein in South Africa, the fourth largest gold mine in the world, which affords an interesting comparison with the Canadian champion, Hollinger, which is third in point of production. Crown Mines stands first, and Government Gold Mining Areas, second, the outputs for 1922 being:

	Ounces
Crown Mines	602,960
Government G. M. Areas	600,954
Hollinger	590,385
New Modderfontein	474,945

For 1923 the order will probably remain the same. At the end of next year, however, we shall probably see Hollinger well in the lead. The world's record is another matter. In 1913 Crown Mines produced 772,193 ounces. It will probably require an additional year for Hollinger to match that output.

THE PROGRESS OF CONSOLIDATED

During the past year prices of Consolidated's chief products, the base metals, have not been high and recently have declined. It is, therefore, highly satisfactory to note that the directors have been able to announce a 6 per cent. dividend for the year 1923. Only the excellent sources of ore available, notably at the Sullivan mine, and the superior technology of the concentrating, smelting and refining processes have made this possible.

With the announcement of the dividend has come the following official statement:

"While the results of the year's operations might warrant a larger dividend, the directors think that it is in the best interests of shareholders to strengthen the treasury rather than make too generous a distribution of profits. Moreover, increased production calls for additional working capital.

"The new mill at the Sullivan Mine is working quite satisfactorily. Current Smelter production of lead and zinc combined is exceeding 7,000 tons per month. Silver production is about 250,000 ounces per month.

"A start has been made on milling Rossland ores—some 400 tons being treated daily. It will be some months before anything really definite can be said as to the future of the Rossland properties.

"The plants and mines are in good condition.

"Satisfactory progress is being made by the West Kootenay Power Company in the development of additional hydraulic and electrical energy at Bonnington Falls."

TRAIN AND BOAT SERVICE TO QUEBEC GOLD-FIELD NOW ARRANGED

The activities of lumbermen, pulp and paper companies, prospectors and mine operators in the counties of Temiscamingue and Abitibi, Quebec, served by the new railhead of the Canadian Pacific Railway, at Angliers on the Quinze river, is such that transportation facilities for both summer and winter travel have now been organized from that centre. The provincial government have announced their attention of establishing at Angliers an assay office to be operated by J. T. Donald and Co. of Montreal, and it is probable that the mining recorder's office now located at Ville Marie will be moved to the railhead. The new winter road from Angliers northward to the gold district will soon be in commission.

It is now announced that a suitable freight and passenger train service to meet the requirements will be established on the new line of the Canadian Pacific Railway as soon as the necessary formalities of its inspection and approval by the federal and provincial authorities have been completed. This will serve adequately those who will use the new winter road northward, which will join the present east-west road along the gold belt at or near Lake Olier. It has been decided by the provincial government to construct a summer road from the head of Lake Opasatika eastward to the gold properties in Rouyn township, commencing next spring.

To take care of the summer travel up to the head of Lake Opasatika, whence the last mentioned road will extend into the prospective mining area, arrangements are being made for a regular motor-boat service operating in conjunction with the railway. Passengers and freight arriving by rail at Angliers will be transferred to motorboats on the lower system of lakes. A feature of this boat service will be the construction of a tramway portage at the Barrière portage, on which it will be possible to transfer the passengers and freight from the boats on the lower lakes to a connecting boat service to be operated on the upper waterway. The construction of this tramway portage is to be undertaken at once.

The provincial government has appropriated $200,000 for the building of the summer and winter roads, contracts for the boat service are being arranged, and a train service from and to the south will be inaugurated as soon as government action permits.

MINING MEETING AT NELSON

The annual meeting of the Mining Association of Eastern British Columbia was held recently at Nelson. There was a large attendance and the proceedings were notable for some announcements of first-rate importance to the mining industry of the Province.

It was stated that, commencing on January 1st, the price of treating lead ores at the Trial smelter of the Consolidated Mining and Smelting Company will be reduced $1 a ton.

S. G. Blaylock, general manager of the Trail smelter, reported that a collection of British Columbia ores had been sent forward to form part of the Canadian exhibit at the British Empire Exhibition in England. These included samples of ore from various shipping mines as well as samples of smelter products. All these would be labelled appropriately. They had been sent through the agency of the government. The idea was to impress English financiers with the fact that British Columbia has customs smelter as well as many custom shippers of ore.

Lead Smelting Charges Reduced

The announcement of a new schedule in regard to lead charges at the Trail smelter was made by T. W. Bingay, comptroller of the Consolidated Mining and Smelting Co. The new schedule, he stated, would be effective from January 1st. There had been a number of difficulties to be met. Labor costs were higher than at the time of the last schedule. Coal prices were at present no better, and the peak prices were being paid for coke as in the days of the war. In fact, coke prices were just double pre-war prices.

Nevertheless, commencing at the first of the new year there would be a decrease of 50 cents a ton on the base rate in regard to the treatment of lead ores. There would also be a cut on zinc of from 30 cents to 25 cents a unit. The reduction would mean to Slocan ores about $1.00 a ton. Another adjustment is a reduction in the refining charge for the pooled lead of $1 a ton; that is, it is reduced from $15 to $14 a ton.

Policy of Consolidated

J. J. Warren, President of the Consolidated Mining and Smelting Co., in responding, asserted that it was always a pleasure to him to meet the mining people of the Kootenay. He believed that the relations between his company and the mining interests were steadily improving. In fact, he began to believe that ultimately, when he was dead, they would agree that he had not been so bad a fellow after all.

The aim of the Consolidated, backed by the C. P. R., during the past nine years, said Mr. Warren, had been to place mining on a sound basis rather than merely to make money. Consequently the establishment had been built from the foundation up rather than from the roof down. Reductions in the charges on shipments had been made as fast as had been possible. It must be remembered in that connection that only 40 per cent. of the Company's products were sold in Canada, and it was only natural that there should be some difficulties in marketing the balance in the world markets. To get the best results there must be mutual confidence. The Consolidated, he said, would not hurt the miner; in fact, it was as much interested in his success as he was himself. "If you produce he ores," said Mr. Warren, "we shall give you the best prices we can and sell the metals for the best prices we can obtain, to our mutual advantage."

The following are the officers for the coming year: - President, R. Randolph Bruce, Invermere; Vice-President, J. P. MacFadden, New Denver; Secretary-Treasurer, W. H. Burgess, Kaslo; Executive--W. A. Cameron, New Denver; Mayor James Anderson, Kaslo; E. G. Montgomery, Kimberley; W. T. McDowell, Ymir; Douglas Lay, Rossland; S. S. Fowler, Riondel; T. W. Bingay, Trail; S. G. Blaylock, Trail. H. Gigerich was reappointed Auditor.

EMMET MERCURY BOILER

A development that may interest miners, as it does the users of steam power, is the commercial-size unit of the Emmett mercury boiler, described in *Power* of Dec. 4th. Mercury is volatilized instead of water, the heavy vapour is used in turbines, and since it is still at 812 deg. F., is used in a vapour boiler to make steam. The over-all efficiency of the plant is approximately that of the old system. The mercury boiler [illegible] several months of the [illegible]. Trial runs have been satisfactory so far to hold out good hope for ultimate success.

The United States Bureau of Standards has under way a research with a view to finding a means of making silver more resistant to tarnish.

More Letters from Porcupine

I—Concerning Night Hawk Peninsular and Sundry Other Matters

The history of the Night Hawk Peninsular mine is the history of an idea, as will be perceived by those who read what follows:

The eight original Peninsular claims were staked in the year 1907. The evident reason for staking was a small outcropping of quartz, an outcropping of no particular significance. During the year 1916 Night Hawk Lake was lowered three feet, and another quartz outcrop was exposed. This was the first showing of what is now the important No. 1 vein. In the winter of 1916-17 the Bonbright Company, of New York, acquired an option on the property and started sinking on No. 1. When the shaft had been sunk to a depth of 80 feet and a small amount of drifting had been done, work ceased and the option was dropped. It will be remembered that during the whole of 1917 gold mining in Ontario was at its nadir. Incipient enterprises had little chance.

Through the initiative of the present manager, Mr. A. R. Globe, formerly assistant manager of the Hollinger, the present owners acquired the eight original (Auer) claims in 1920, along with a number of other claims on the NE-SW strike of the measures. The Ontario Government treated the Company liberally in the matter of granting certain water leases that covered subaqueous areas necessary to consolidate the Company's holdings. The present holdings of the Peninsular comprise 880 acres. Leases on 11 additional claims were dropped.

The property is situated on an irregular projection of land jutting into Night Hawk Lake from the north. It lies 11 miles from Connaught, a station on the T. & N. O. Railway's branch line between Porquis Junction and Timmins.

When Mr. Globe decided to assume the responsibility of recommending the property to his principals, the only positive evidence that he had to go on was the fact that on the 80-foot level an ore-shoot, 120 feet long and six feet wide, averaging $12 to the ton, had been drifted on. Geological deductions from the occurrence of detached outcrops constituted his indirect evidence.

The Peninsular is now a producing mine, well equipped, and possessing ore reserves more than adequate to meet the demands of its new mill. The main shaft is down 425 feet. About 4,500 feet of lateral development has been carried out. The diamond-drilling footage totals 7,840 feet. A winze is being sunk from the fourth (425-foot) level to the 550-foot level. Stoping has barely commenced. The ore-bodies, chief of which are veins Nos. 1 and 4, are exceptionally substantial. The general average gold content of the ore is between $10 and $12 per ton.

In a diagrammatic way the geology of the property may be indicated thus:- To the north lies a dyke of serpentine, striking NE-SW, and dipping to the south. Immediately to the south of the serpentine, and lying between it and the green carbonate schist, is No. 1 vein. It, also, dips to the south. Beyond the green carbonate comes No. 4 vein, which marks the contact of the green with the gray carbonate, the latter being variously denominated altered basalt, carbonated basalt, etc. In this rock are found unaltered inclusions of basalt. The last member of the petrologic group is andesite.

There are numerous smaller veins and ore-bodies, but veins Nos. 1 and 4 are the two of present major importance. At places they attain widths of more than twenty feet. No. 4, unlike No. 1, did not outcrop at the surface. It was traced on the third level by following an erratic stringer. At that level it showed a width of six feet; at the 425-foot level its width increased to more than 18 feet. Further north-easterly drifting developed a greater width.

There are points of remarkable interest about the vein system. These will be touched upon at a later date.

At successive stages of the mine's development, competent mining engineers have been called in by investors. At least seven different times the mine has survived the trial of checking and re-checking at the instance of purchasers of large blocks of stock. Not long ago it was examined by the representative of London-South African capital. As a consequence, an offer was made, a very substantial offer, the acceptance of which would have entailed the transfer of control to London. The offer was not accepted.

The 200-ton mill is now in commission. It would not have been in existence had not Mr. Globe had the temerity to recommend his associates to take a sporting chance in new territory. The fact deserves elaboration. It suffices just now to remark that, since the beginning of the Company's work, risks and expenditure have been carefully controlled. There has been ample warrant for each addition to plant. Equilibrium and stable balance are the characteristics of the enterprise.

* * *

It is a self-evident fact that the prospector in the Porcupine region feels himself the victim of unjust treatment. He believes, or is willing to believe, that mining companies and their scouts — and even the Provincial Government — are in collusion to defraud him. He is specially given to thinking that assay results have been maliciously lowered with the object of discrediting his property. To him the scout has become anathema. And for this there is at least a colour of reason.

To my mind it is unfair to all concerned for mining companies to send their field engineers on casual visits of inspection. The scout is clothed with no authority, and with no discretionary power as to expenditure. He can recommend the development, further investigation, or the purchase of mining claims; but his recommendations are assuredly more frequently ignored than acted upon. Hence both the prospector and the scout are placed in injuriously wrong positions. It is not fair to blame the scout. He acts under orders. But, as a thinking human being, he cannot believe that a cursory sampling of a property can justify him in praising or damning it. In

evitably the latter course is the easier. Hence much of the henceness of the whole miserable business.

* * *

Unquestionably the mining companies should adopt a different policy in their treatment of the prospector. Their field engineers should be empowered to make exhaustive preliminary examinations, instead of being forced to give snap judgments. The difference in expenditure would be an inconsiderable item. The *Canadian Mining Journal* will earn the gratitude alike of the defenceless prospector and of the misused scout if it does all in its power to correct this grave abuse.

* * *

There is a loose parallelism between the prospector and a rabbit that figured in a recent incident. Several French-Canadian prospectors were paying a short visit to some mining claims in a township south of Timmins. It happened that on the last night of their stay there was found to be a considerable excess of bread. At nightfall one of the men tied a loaf of bread to a stump in front of the cabin. At the right spot under the suspended loaf he set a small and powerful steel trap. In the morning the loaf had been nibbled down one edge. There was collateral evidence to show that the nibbling had ceased with extreme abruptness. A rabbit had come along, had stood up to sample the bread, had grown too confident, and had sat down on the trap. The trap had responded—for, mute but incontrovertible witness, there was the stub of the rabbit's tail in the trap, cut off as though by a skilled surgeon. Perhaps some wanderer in the bush has already shot that rabbit and woven a new, strange tale. Mr. Charles G. D. Roberts or Mr. Thompson-Seton (that reciprocating name may not be correct) might weave a story of another kind. This happens, as set forth above, to be the truth. The rabbit's narrative is not procurable. If it were, it would be poignantly confirmatory.

* * *

The suggestion made some months ago in the *Journal's* editorial columns regarding the mining *entrepreneur* is highly applicable to the real needs of the prospector. He requires interpretation and guidance. At present he must depend either upon the tender mercies of the compassionless corporation or upon the dangerous exploitation of the promoter. If companies dealt with prospectors openly and in friendly fashion, — and this is possible, no matter how utopian it sounds——giving discriminating advice and practical help, the situation would be vastly improved. Mutual confidence thus inspired would speed up work, tend to eliminate useless labour, and greatly augment the companies' chances of getting hold of good prospects.

* * *

Many, if not the majority of, prospectors feel that the Provincial Department of Mines is paying them much less attention than they deserve. The requirements for assessment work are strongly objected to, and this will be discussed in a later letter. The kernel of the nut is that the prospector looks upon the Government as either passively not friendly to him or as positively inimical. In this the prospector is, of course, wrong. But it is certain that the Government could do a great deal more for this most useful class of citizen. At present it is impossible to procure geological maps of Porcupine. The most useful publications are out of print. Recorders' offices are used primarily for the collection of revenue.

There is no valid reason why the Department should not utilize these offices as centres from which to distribute useful and timely printed matter. Pamphlets, designed expressly to help the prospector to an understanding of the geology of each district, printed both in English and in French, would be appreciated and used. Assuredly, also, prospects should engage more of the Department's attention than they now do. Technical advice is sorely needed in the townships that will sooner or later become Tisdales and Deloros.

Putting it briefly, the prospector gets precious little for his money.

J. C. MURRAY.

AN OFFER TO PROSPECTORS

Prospecting has sunk to such a low ebb in Australia that it requires an artificial stimulant. Here are details, from *Chemical Engineering and Mining Review* (Melbourne) of a recent offer to prospectors by the government of New South Wales:

The N. S. W. minister for mines, Mr. J. C. L. Fitzpatrick, announces that the reward of £1,000 offered by the government for the discovery of a new mineral field has been amended to make provision for the payment of smaller rewards, viz., £500 and £200 respectively, for the discovery of fields of less magnitude, and that the scope of the rewards has been increased by the addition of chromite, manganese, molybdenite, scheelite, wolfram, platinoid metals, bismuth, aunite, asbestos, bauxite or clays containing free alumina, magnesite and slate to the minerals specified in the previous notice, viz., gold, tin, silver, copper, lead, diamonds, precious opal, mercury and platinum.

The conditions of the latest rewards are:—

(1) (a) The sum of one thousand pounds (£1,000) if it be proved to the satisaction of the minister that within 24 months after he has been notified of such discovery not less than 250 miners have been profitably employed in mining continuously for at least three months within a radius of five miles of such discovery.

(b) The sum of £500 if it be proved to the satisfaction of the minister that within 24 months after he has been notified of such discovery not less than 125 miners have been profitably employed in mining continuously for at least three months within a radius of five miles of such discovery.

(c) The sum of £200 if it be proved to the satisfaction of the minister that within 12 months after he has been notified of such discovery not less than 50 miners have been profiably employed in mining continuously for at least three months within a radius of five miles of such discovery.

(2) That the site of the discovery be distant not less than 10 miles from the nearest mine in which similar payable mineral has been or is being obtained.

(3) That such discovery be made known to the minister for mines within three months after such discovery or such further time as appears, under the circumstances, to the minister to be reasonable.

(4) That only one reward shall be paid for any discovery within the area described in clause 1.

All previous notices of rewards for the discovery of mineral fields are cancelled by the new notice, which operates as from October 3.

It is reported that a Dutch company is to erect iron blast furnaces in Borneo in the near future.

NEW MODDERFONTEIN REPORT

The annual report for the year ending June 30th last of the New Modderfontein Gold Mining Company, one of the most important mining companies in South Africa, was presented to the share-holders by the chairman, Sir Evelyn Walkers, in Johannesburg on November 6th. Some of the information he gives affords an interesting comparison with gold mining in Ontario, particularly at the Hollinger. The report includes the following paragraphs:

"The net profit amounted to £1,678,418, and this figure, which includes the working profit of £1,653,481, has only once been exceeded in the history of the mine, namely for the year 1920-1921, when the price of gold was very much higher. But with the price of gold taken at its standard value, a striking difference is seen in the total working profit earned in the two periods; on this basis the profit amounted to £847,-625 for the year ended 30th June, 1921, whereas it was £1,540,897 for the year ended 30th June, 1923. I have purposely avoided making a comparison with the year 1921-1922, owing to the strike which dislocated operations so seriously in that year and which therefore renders impossible any true comparison between the two years' results.

"The main disbursements for operating profits are two dividends of 50 per cent. each, [the share capital is £1,400,000] accounting for £1,400,000 and the payment of Government and Provincial taxes for the year, totaling no less than £241,958.

Increased Efficiency of Miners

"With regard to the past year's operations, I must draw your attention to the following facts: (1) a record tonnage of 1,340,000 tons was crushed, being 257,000 tons greater than the tonnage crushed in 1920-21, the next best year; (2) working costs averaged 16s. 8d. per ton milled, showing a satisfactory reduction as compared with the costs of the two previous years, and being bettered only on two occasions, namely, in the years ended June 30, 1910, and 1915; (3) the ore reserve of 9,060,800 tons at 8.8 dwts. stands both in tonnage and value at a higher figure than at any time in the past ; (4) the ore developed during the year, amounting to 1,653,700 tons valued at 11.5 dwts., is greater both in tonnage and value than that for any preceding year; and (5) the development footage accomplished, of 23,581 feet, has only been exceeded on one occasion in the past, namely, in 1917, when the total footage of development work was 27,117 feet. [A pennyweight is one-twentieth of a troy ounce, and therefore one dwt. of gold is worth approximately one dollar.]

"The improved results shown above are undoubtedly due to the reorganization of underground working conditions effected after the strike of 1922 and to the improved efficiency of both white and native workers. It is an admitted fact, which we are glad to acknowledge, that since the upheaval the company's white employees have paid more attention to their duties and their service to the company which affords them employment. The improved spirit which has prevailed and the example so afforded have necessarily permeated throughout all sections of the mine to the native workers, who also have willingly responded in a marked degree.

"The following few examples of the increased efficiency will serve to illustrate this point:

"Fathomage broken per machine shift, July to December, 1921, .993; July to December, 1922, 1.383; January to June, 1923, 1.442.

"Tons handled per underground native per month: July to December, 1921, 28.3; July to December, 1922, 29.4; January to June, 1923, 29.5.

"Average monthly tonnage crushed: July to December, 1921, 102,800; July to December, 1922, 110,-700; January to June, 1923, 112,700.

"Cost of producing 1 oz. of fine gold: July to December, 1921, 46s. 6d.; July to December, 1922, 36s.; January to June, 1923, 34s. 7d.

Economies from Research

"From the foregoing figures you will observe the extent to which efficiency has increased. But it would be misleading if I omitted to mention that these improved results have been brought about not only by the greater efforts on the part of employees, but also by more and better facilities provided by the mine. Experiments are constantly being carried out to secure better quality drilling steel, better supplies of compressed air and better results from explosives. It is obvious that success in these directions can only be attained by the expenditure of considerable sums of money and by much time and thought given by the technical officials employed by and associated with the mine. That a considerable measure of success has already been achieved is admitted by all concerned; and there is every reason to suppose that further advances in mining practice will be made, as time goes along, to the benefit of the whole gold mining industry.

Ore Reserves

"Turning now in more detail to the past year's mining operations, you will observe that the ore milled amounted to 1,340,000 tons, and the yield per ton was 9.4 dwt. The payable ore developed amounted to 1,-653,700 tons, valued at 11.5 dwt., with the result that an improvement has been shown not only in the tonnage, but in the value of the ore reserve. The ore reserve, as re-estimated at June 30th last, amounted to 9,060,800 tons, valued at 8.8 dwt. over an average width of 66 inches, and it is not necessary for me to elaborate the point that the mine is in an exceedingly strong position.

Corduroy Concentration

"In metallurgical practice the results achieved during the period under review were entirely satisfactory. The introduction of corduroy blankets in replacement of the amalagamation plates can be definitely stated to be a successful innovation, as is shown by the fact that, whereas the cost of plate amalagamation per ton milled was 3.2d. in 1921 and 3.4d. in 1922 (excluding the three months' strike period) the cost of corduroy concentration during the first nine months of 1923 was 1.9d. only. The latter figure includes non-recurrent expenditure on account of the extra equipment required and the necessary alterations to the reduction plant, so that we may expect it to be improved on in future. Every precaution is taken to safeguard the health of employees in the reduction works and to minimise the opportunities of theft of gold, our endeavour in these two directions being greatly assisted by the change-over to corduroy concentration.

South African and Ontario Taxes

"You will observe from the directors' report that your company paid Government and Provincial taxes during the past year amounting to no less than £241,-958, quite apart from the annual sum of £17,310 pay-

able to the Government in respect of undermining rights lease. In other words, Government and Provincial taxes alone absorbed 14.4 per cent. of the company's net profits. One cannot but envy the shareholders of, say, the Hollinger Consolidated Gold Mines of Canada, whose property is in some respects comparable to your own, but is fortunately situated in Ontario, where taxation is levied at a more reasonable rate."

STUDIES OF FLOTATION

The issuance of Technical Paper 262. "Certain interfacial tension equilibria important in flotation," by Will H. Coghill and Carl C. Anderson, is announced by the United States Department of the Interior, through the Bureau of Mines. The report contains the results of investigative work performed under a cooperative agreement between the Bureau of Mines and the University of Washington.

The successful use of flotation for separating ores and the uncertainties surrounding the observed facts have resulted in an extensive literature. As a consequence many physical and chemical principles that otherwise would have been regarded as foreign to the metallurgical field have been called to attention and offered in explanation of the phenomena observed.

Present Knowledge Empirical

Some idea of the tremendous importance of flotation as an industrial process is obtained from the fact that in a recent year it was utilized in treating some 70 million tons of ore. However, although this process profoundly influences modern practice in ore concentration, knowledge regarding it is largely empirical. For this reason writers have studied some of the principles often mentioned in the literature.

In part I of this paper, the authors discuss the equilibrium of the interfacial tension forces of two liquids and a gas. The Neumann equilibrium triangle was employed jointly with cathetometer observations of a lens of one liquid resting on another. The angles derived by the use of the Neumann triangle and those derived by principles of mechanics have been compared.

The configuration of the surfaces and the interface of a lens of one liquid resting on another has been shown in detail by drawings.

The following combinations were studied — paraffin oil on water, carbon tetrachloride on water, aqueous sodium oleate and benzene, aqueous acetic acid, and paraffin oil.

The analogy of the flotation of a heavy liquid and of a solid, each floating by "film suspension," has been discussed.

Studies of Surface Tension

In Part II, the authors consider the surface-tension phenomena of a solid, a liquid, and a gas in contact; the angle of contact and the edge effect.

The Neumann equilibrium triangle can not be used in a consideration of the interfacial forces of a system containing a solid, a liquid, and a gas, but by co-ordinating the surface energy of a solid with the surface tension of a liquid, an equation containing the angle of contact of a liquid with a solid may be used. The angle of contact bears the same relation to the interfacial energies of the sytem, solid-liquid-gas, as the Neumann equilibrium triangle does to the interfacial tensions (or energies) of the system, liquid-liquid-gas.

The phenomenon of the overfilled tumbler is described. The difference in size of floatable bodies of cylindrical shape and of prismatic shape is brought out. The edge effect was studied by making cathetometer measurements of the heights attained, before overflowing, by pure and modified liquids on beveled glass plates having various solid angles.

From a consideration of the curve representing the profile of the surface of a liquid meeting a solid and of the angle of contact the theoretical heights that liquids will attain on horizontal plates before overflowing were determined. An explanation of why a liquid is reluctant to cross a convex edge is given; the liquid's deportment depends on the dip of the face it meets after crossing the edge.

Edge Effect

The principle of edge effect explains why mineral floats away by film suspension in the gold sluices, on the concentrating table, and on the film-suspension flotation machine.

A liquid may make a small angle of contact against a plane face of a solid in massive form, and in turn make a large angle against the same material powdered and cemented on a plate.

The contact angle is closely related to the spreading power of a liquid on a solid; when it is zero, the liquid is said to spread on or wet the solid. Amalgamating, tinning, galvanizing, and leading are examples of spreading. As spreading takes place, the inequality of the interfacial tensions acting in any one of these is indicated. Minute traces of contaminants often suffice to prevent the spreading of a liquid on a solid. A consideration of the subject of spreading is essential in obtaining efficient coal dust sprays, detergents, animal dips, horticultural sprays, etc.

Technical Paper 26 may be obtained from the Department of the Interior, Bureau of Mines, Washington, D. C.

CANADIAN HOLDINGS OF ASSOCIATED GOLD MINES OF WESTERN AUSTRALIA

The annual meeting of Associated Goldfields of Western Australia was held in London on Dec. 14th. The directors' report shows that the company owns 31,800 shares of the Huronian Belt Company's 200,000 shares of £1 each; 474,636 shares of the Keeley's 2,000,000 shares of $1 each; and 327,671 shares of the Vipond 2,000,000 shares of $1 each. Apart from being a large holder of Keeley, Vipond, and Associated shares, the Huronian Belt Company owns, and is interested in, a number of claims in close proximity to the Keeley mine, and is actively engaged in opening up the Maidens property in the South Lorrain district, situated on a geological formation similar to that of the Keeley mine. The Company also owns a large number of claims, options, and other interests in several mining fields of Northern Ontario, on which prospecting work was started during the summer and will be actively resumed in the spring. The report also mentions the fact that the Keeley produced 1,743,138 ounces of silver from July, 1922 to the end of October, 1923, in addition to a regular output of cobalt ore. The reserve of ore of a grade of not less than $10. per ton at the Vipond is stated to be such as to afford at least a two years' supply to the 150 ton mill, without including reserves of ore of a lower grade.

Canada's Mineral Industry

Some Encouraging Facts Cited, in Rebuttal of Mr. C. M. Campbell's Conclusions

Mr. C. M. Campbell's papers on "Publicity and Mining," presented at the Trail meeting of the Institute in October and published in the December *Bulletin*, has brought an avalanche of criticism in the January *Bulletin*. As this brings out important points that have not, in the main, been incorporated in this discussion previously, salient paragraphs are reproduced below. The first part of the discussion is by Dr. C. V. Corless, as follows (in abstract):

Dr. Corless Paints a Picture

It is a depressing picture we have presented to us in the December *Bulletin*. To quote a paragraph (page 647):

"Let us now pass on to another phase of the situation. As you go South from the 49th parallel, along the prairies, you pass through wheatfields, then cornfields, and then through fields of cotton to a sea where there is perpetual summer. Travelling north, however, you pass through wheatfields to an area where the trees get smaller and smaller and finally disappear. You then pass through the Barren Grounds where only grass will grow in the summer. Finally you reach what Captain Markham called the "paleocrystic sea," along the shores of which are scattered the bones of explorers from Franklin to Crawford."

How much publicity of this kind, particularly if its source is the C. I. M. M. and and its medium the *Bulletin*, will be necessary to stop all immigration and swell the tide of emigration until Canada's population dwindles to insignificant numbers?

Isolated facts are but the pigments of a picture. We may select and combine them in any way we please, creating at our will either a true or a false impression. Though the facts selected and combined may be true, the resulting impression caused by the picture may be wholly false. Reason and judgment are our only guide, if we are seeking to impart the truth rather than to create a merely artistic effect.

To illustrate: It is easily possible to reverse the effect of the author's above description by similarly selecting and combining facts along other north and south lines crossing our international boundary. We might select a second line of travel, passing through the famous fertile lands of the Peace River district and the western section of the Canadian prairie, where cattle may remain in the open all winter; passing across snow-clad peaks of the Rockies; and ending in the desert of Arizona or New Mexico. Probably more bones of explorers would be found near the southern end of this line than are depicted as scattered along the northern end of that described in the paragraph quoted. Or, we might, with equal reason, select a third north and south route, slightly west of the 79th west meridian and paint a magnificent picture of the Canadian end of it; as crossing two of our great treasure-laden inland seas, between which lies one of the world's finest and most productive fruit belts; passing great and prosperous cities and highly developed farms, all supplied with power and light from one of Nature's greatest scenic wonders near at hand; on into a territory dotted with myriads of beautiful lakes, which is fast becoming the play and sporting ground for our southern neighbours, when they are driven from their cities by the insufferable summer heat; past new but thriving towns springing up because of untold hidden wealth in nickel, copper, silver and gold; past other flourishing communities rising from some of the world's greatest forest industries in lumber and paper; across a second broad belt of highly fertile land, as extensive as that already crossed, opened up by railways and lying ready for the settler; and on to the shores of the world's third largest mediterranean, teeming with fish and game and surrounded by mineral lands a sea destined to bear the argosies laden with the farming wealth of Canada's productive western plains.

Harmful Effects of Sombre Picture

If the author's purpose was not to depreciate his country, and particularly his native province, why did he deliberately seek publicity for such a dismal picture as this? No Canadian, well-informed about his country, will accept it as truly representative. But because there are hundreds who are not well-informed, for every one who is, the impression created by such an over-drawn description may do vast harm.

It is the utterly false impression of Canada, created by such descriptive paragraphs as this, that has been one of our country's greatest handicaps in its development. How any Canadian, with real knowledge of his country and the kind of red blood in his veins resulting from our wholesome pioneering life and our invigorating climate, can deliberately sponsor such publicity as this, is beyond my understanding.

* * *

The author next attributes to me the statement, "that this two-thirds (of Manitoba) will produce 'inconceivable wealth in minerals,' that here 'the only permanent industry is or will be mining.' "My statement in the former case was made of the entire pre-Cambrian, of which the part in Manitoba is roughly only about one-twelfth. In the latter case my statement was made regarding the great non-agricultural part of Canada as a whole. Besides these misrepresentations, the author has omitted two important words which greatly change the meaning, though he encloses the words in quotation marks, as if the quotation were exact. Now the only worthy purpose of criticism is to get at the truth. This very unusual method of criticism seems to indicate that the author's conception of its purpose is to score a point.

* * *

The author speaks very grudgingly of the great mining achievements already made in what he chooses to refer to as "that prolific section in northern United States and Canada which has been so frequently referred to," mentioning in turn the iron, copper, nickel, silver and gold, and dismissing each with a passing grouch, of too childish a nature to deserve serious criticism. His remarks regarding recent silver and gold discoveries indicate that he is badly out of touch with developments in these areas within the past 3 or 4 years. These five great mining areas are well able to speak for themselves and each of them has so long a future before it that there need be no worry for many years to come regarding their not being duplicated. Discoveries are in fact still being made in all those in Ontario. In the case of some of them, production is indeed but little more than well started.

Need of Intensive Prospecting

The author's final conclusion regarding the pre-Cambrian (page 666), that the great need is intensive pros-

pecting, consisting in detailed geological work, trenching, diamond drilling, etc., and his statement that this demands large capital outlay, constitute, in my judgment, the most valuable part of his paper. This view is in exact accord with my own, as expressed in the paper which he so persistently attacks and as repeatedly emphasized in later discussions. A discussion of the respective parts in this work proper to the government, the prospector, and the mining syndicate or company, would be of very great interest but lies outside the purpose of the present criticism.

But, though I am glad to find that the author and myself are in agreement on this point, I frankly admit that our views appears to be poles apart on others. And one at least of our points of difference appears to consist in this: I believe wholeheartedly in the vast extent of our mineral wealth; consider, therefore, the admittedly large expense necessary for intensive search for ore, many times worth while; and, consequently, try to do what little I can to assist and to encourage this class of work; whereas, it appears to be clear from this paper and from the author's previous criticisms, that he does not believe that Canada's mineral resources are of any great extent; that this disbelief causes serious misgivings as to the justifiability of entering into such expenditure of capital in the search for mineral, which may not, and probably does not exist, or which, if it does exist, is concealed by such insuperable difficulties as to make search for it almost futile; and that he is, therefore, apparently trying to discourage the search for valuable minerals by magnifying their supposed scarcity and the difficulties to be overcome in the search for them.

* * *

The mining industry will have its ups and downs. But such close intelligent co-operation as we now have in Ontario, among geologists, prospectors, mining engineers and capitalists, if only we can keep the crooked promoter, wildcatter, and broker from diverting capital from the actual work on and in the ground, will rapidly bring mining to the very fore-front of our basic industries.

The United States has three times our possible farming area, yet mining has overtaken agriculture in that country. With our vast areas, in which this kind of detailed prospecting is possible and in which we now have almost irresistible reason for believing vast mineral wealth to lie hidden, Canada's mining industry will probably overtake her present greatest basic industry, agriculture, long before her population approaches the existing population of the United States, particularly, if Canadians in the near future awake to the national necessity of supplying themselves with those basic industrial requirements—coal, iron and steel.

* * *

Long-Lived Mining Camps

I note, that the mineral resources in which our country is known to lead or to stand very high are either dismissed by the author with a disparaging remark, or pass unnoticed altogether. Of the nickel he says (page 665): "It is 40 years since the Sudbury deposits were discovered and these finds have not been duplicated." I should think not. The ore in the Sudbury nickel area is not yet all discovered. Again, our asbestos deposits, in which Canada leads the world, are not even mentioned. Of our nickel, silver, and gold deposits, at Sudbury, Cobalt, and Porcupine, he says (page 649): "even there there is no certainty of indefinite life." The author must surely mean perpetual life:, the productive life of these districts is surely "indefinite" enough when all three factors that could make their life definite, viz., number and extent of orebodies, as well as rate of mining, are unknown. No mine has a perpetual life. The life of very few mines is definite.

* * *

Now, as I have recently stated in the *Canadian Mining Journal,* I am whole-heartedly in sympathy with the author in his zeal for economy and sanity in the development of Canada's natural resources. But that he should make the expression of his views on this matter the occasion for so violent an eruption against his own industry as to necessitate the bolstering up of weak argument by the use of mis-statements, mis-representation, and even mis-quotation —carelessly, —seems to indicate so illogical a relationship of ideas as to suggest a brain-storm. Just why the mining industry should be selected and pilloried, as if accountable, in some obscure way, for the greater part if not all of Canada's economic and other mistakes and difficulties — from destruction of scenic beauty, rash expenditure of money in cities, and over-fishing of one of our many rivers, to over-expansion of our railways, and even to severity of climate in some parts of our half-continent — is a question that may well puzzle any reader, who desires to delve beneath the charm of artistic literary style, and who wishes to grasp and weigh critically the realities dealt with as well as to try to estimate the probable harvest to be reaped from this kind of publicity.

* * *

We should also consider with great care, the effect of such papers on the minds of those to whom the industry must look for capital to carry on the work of detailed prospecting. If it comes to be widely believed that any considerable number of our members hold the views expressed in this paper and in some other of the recent statements of its author, the mining industry in Canada, will have been done untold injury.

Professor Mickle's Argument

The following paragraphs from Prof. G. R. Mickle's remarks illustrate well the logic of his argument:

I have read Mr. C. M. Campbell's paper with the above-mentioned title and agree with many of his remarks in so far as he deplores the waste and destruction of our resources and ridicules extravagant ventures based on a gambler's hopes. By all means let us be accurate and call the surveyor who makes an absolute mistake to account, as Mr. Campbell says we should. The writer who uses a wrong mode of reasoning with regard to estimates of the future should, I think, also be called to account. Mr. Campbell in this paper follows what I consider is the same fatal fallacy that he has in previous writings, one of which was quoted and commented on in the December 1922 *Bulletin.* Mr. Campbell still adheres to the same idea of the measured ore body as the only guide to the amount of production in the future. Dr. Corless has alluded to this phase of the matter in the following way: "A few years ago we heard more discussion about estimating proven ore reserves than about applying knowledge and reason to finding ore. No doubt these discussions did some good but they also had a somewhat deadening effect. Now the mining engineer who does not look beyond the ore he can measure, who is not intent on using ascertained facts as a stepping stone to probabilities, will not get very far." (Trans. Can. Inst. M. and M., vol. 25, p. 23.) I should think it had a deadening effect! Let us see why its use and application is only limited and why [illegible] too low and is therefore useless. As an example we will take the [illegible] early productive life of this organization. The following figures are taken from the reports for the years in question.

Nipissing Mines Co.

1909

Production for year 1909	4,728,131 oz.
Reserves (developed and partly developed ore)	6,552,880 oz.
Total production to end of 1909	12,747,468 oz.

1910

Production for 1910	5,548,660 oz.
Reserves (developed and partly developed ore). The large tonnage of mill rock on the dumps and in the mines is not covered by the estimates.	6,552,880 oz.

1911

Production for 1911	5,197,042 oz.
Reserves (developed and partly developed ore)	6,126,838 oz.
Mill rock on dumps	4,151,995 oz.

1912

Production for 1912	4,688,261 oz.
Reserves (developed and partly developed ore)	5,491,343 oz.
Mill rock on dumps	4,151,995 oz.
Production to end of 1922	65,700,579 oz.

And still at a substantial rate.

Anyone following Mr. Campbell's mode of reasoning if he had been asked at the end of 1909 to give a forecast of how much more silver the mines owned by this company would produce would have to take the reserves (which include only partly developed ore) and say 7 million ounces approximately, whereas we see after 1909 it is about 53 million ounces to the end of 1922 only, and production still going on at a substantial rate. Seven million would have been an obviously ridiculous estimate. A similar result would be seen if any mine which could reasonably be considered productive were taken in its early productive life. And it is precisely this kind of mine which is the hope of the mining industry as the young apple tree just coming into bearing is the hope of the orchard. The blocked out and measured ore is a true measure of the complete ultimate production only in cases where the production either never will amount to anything very important or approaching the end of the life of a good productive mine. It is clear moreover that the productive mine, by this I mean the mine that works for a reasonable term of years, will almost always be the main source of production of any given metal or product, and that the percentage derived from any kind of mine except the productive ore during its prosperous period is small, probably not over 10 or 20 per cent of the whole. The measured ore body is thus a true indicator only for a small percentage of the output for the future.

Mr. Haggen's Data

Mr. E. A. Haggen, of Vancouver, editor of the *Engineering and Mining Record,* contributes the following pertinent remarks to the discussion:—

The following statement was recently published by me:—"Dr. C. V. Corless, General Manager of the Mond Nickel Company Ltd., Coniston, Ontario, rendered a national service when he pointed out that while it was customary to regard Canada as an agricultural country, the ratio of agricultural lands to the whole is only 15 per cent, whereas the mineral area of the country amounts to 85 per cent."

This forms the text of a fresh outburst on the part of Mr. C. M. Campbell in a paper read at the Trail Meeting. The paper as published in the December *Bulletin,* has, however, undergone elimination of the several personal references made to Dr. Corless and myself, evidently as the result of the brief criticism to which the paper was subjected.

In my opinion the P. G. E. railway is the most important colonization and transportation project yet promulgated in B. C. and I know the country. It was originally planned to provide transportation to the most important agricultural section of the province, namely Peace river, with its 60,000,000 acres of wheat lands. The route adopted was that formerly proposed by the late James J. Hill, one of the foremost railroad men on the continent. Unfortunately the scheme got into politics, and millions of dollars have been squandered on it for which no value has been received. It is still without a terminal at either end and yet, since it has been placed under expert railway management, it is now pretty well covering operating expenses and increasing its traffic. Contrary to Mr. Campbell's statement, the Britannia mine is on the route of construction of the Howe Sound section, and it also provides with transportation the well-known mining field of Cariboo, where dredging operations are being inaugurated by an English company, after thoroughly testing its ground.

But it is with Mr. Campbell's observations on the mineral industry I wish to deal. His claim that the industry has not delivered the goods is confounded by the facts that in 37 years its wealth production has grown from $10,000,000 to about $200,000,000 a year; its per capita value from $2.23 to $25; its total to date amounting to $3,200,000, or $465 per capita.

His diagram, Fig. 1, is not applicable to a discussion on basic industries founded on natural resources, as manufactures are largely dependent on imported raw materials; and a considerable proportion is derived from mineral production with which that industry might properly be credited. Judging from his remarks accompanying Fig. 2, he appears to be under the delusion that he is the only honest mining engineer we have. The value of graphics, properly presented, has been endorsed by some fifteen leading engineering organizations.

He admits "'records of dividends make good copy." They do more. They are the best index of investment value. What are these records? The mines of Canada have paid in dividends about 10 per cent of the value of the production. They have contributed a similar proportion to depreciation, depletion, equipment, and the development of reserves, consonant with the nature of the industry as a wasting asset and the "risk of the business." Mr. Campbell cannot point to any other basic industry with that record. The industry is not responsible for the capital losses made in wildcat flotations and watered stock.

With reference to the complaint that British Columbia has not produced a Chile Copper and a Utah Copper. It took 50 years from the first mining of copper in the United States to discover Utah Copper. It took Chile 500 years from the inception of its mining industry to discover Chile Copper. Copper mining in British Columbia is not yet 30 years of age. Give the province the same time as the United States and Mr. Campbell may find himself among the false prophets.

The mineral industry of British Columbia has nothing to be ashamed of. In that period it has developed the largest silver-lead-zinc mine in the world; the three largest copper mines, the two largest concentrating plants for copper ores, the two largest copper smelters, in the Empire; and one of the most important metallurgical enterprises in the world. It is achievement that counts rather than the visions of a timorous dreamer. Coast Range granite which used to be regarded as Mr. Campbell regards the Laurentian, has produced within its boundaries, the Britannia, Marble Bay, Surf Inlet, Hidden Creek, Ecstall, Outsider, and Premier mines. As to the mining engineers seeing nothing but mining, I have met more far-seeing, broad-minded, high standard men among our mining engineers than in other classes of the community, and I could name men in that profession who could manage the public business of the Dominion and its Provinces much more efficiently than is now being done.

Some Recent Developments in Steel Wire Ropes*

By T. ALBERT TAYLOR†

The evolution of the wire rope, from a crude construction of iron or mild steel wire to the complex high-tensile steel "super-ropes" — that to-day are such indispensable adjuncts to up-to-date mining equipment —is one that has developed during comparatively recent years. New types of ropes have been placed on the market; some of these have failed in actual practice to justify the claims of their inventors, while others have been perfected by improved manufacturing methods and machinery, so that they have now become recognised as distinct improvements. At the same time new kinds of steel have been introduced in order to supply the demands of wire rope manufacturers for stronger and still stronger material until the wire rope has reached a degree of strength and reliability that could never have been deemed possible by the early wire rope maker.

Where in the old days one type of rope was made to answer every requirement—the only difference being the number and size of the wires employed —to-day wire rope making has become an exact science, and a selection from dozens of different constructions is possible, while the choice of material has also been greatly extended, so that, given a knowledge of the work to be done and the local conditions, there is no reason why the modern ropemaker who has the necessary experience and equipment should not be able to supply ropes that will give every satisfaction.

When it is considered that the wire selected may be any one of a hundred different grades, qualities, and shapes, and the size will be one of a range of nearly 150 different gauge sizes, it can be understood that the introduction of the new types of rope has rendered a large tested stock very necessary where quick deliveries are desired.

In order to get the best results, the wire rope maker has therefore not only to decide on the type, size and pattern of the component wires, and the quality of material to be used, but he must also know the wire drawer who can be best depended upon to make that particular wire so that it will successfully pass the various tests. In this selection practically the only guides are "trial and error."

It is generally recognised that where heat treatment is required during the process of manufacture the final result is often variable, and for this reason it has been found that while some wire drawers can be depended upon for one class of wire, other makers can supply other qualities and types that will be more satisfactory.

Winding Ropes.

Following the advance of modern practice, the work done by the winding rope has increased enormously of late years, and to-day this portion of the winding gear is a pulsating, palpitating and vibrating unit, as the momentary intervals of rest are insufficient to allow the vibration in certain portions of the rope to die out. Add to this the effect of dynamic stresses such as are imposed when the load is applied and is being accelerated or decelerated, the bending of the rope on the pulleys and drum, and other external influences, and one can have some idea of the constant change which must be taking place both in the rope as a whole and in the structure of the material composing it.

The choice of a suitable type for rapid and deep winding under the conditions that apply to-day is one that demands the closest attention. The ordinary round strand rope that answered the purpose for our grand fathers was practically superseded by the Lang's lay round strand rope that for another generation was recognised generally as the most suitable. The introduction of the locked coil and flattened strand ropes nearly 40 years ago marked an advance that was not recognised at the time. The conditions then were not so strenuous that these types of ropes were so necessary as they have since become.

Locked Coil Rope

When the locked coil rope was patented in 1884 the advantage claimed for this was the use of external wires of such a shape that in the event of a wire breaking it would not detach itself from the rope, but be locked in position. In practice, this rope has been so developed that many more important advantages have been obtained, the principal being that the rope is absolutely non-spinning, so that for deep winding, where wear on guides or shoes is often considerable, also where there is a possibility of collision in the shaft owing to small cage clearance this type is indispensable. For sinking, without guides, no other rope is so satisfactory.

Locked coil ropes are 44 per cent. stronger, size for size, than round strand ropes whilst strength for strength they are 16½ per cent. less in size and 2 per cent. lighter, thus enabling smaller ropes to be used. The maximum elongation of a properly constructed locked coil rope is only 0.3 per cent. (about one-twentieth of the elongation that takes place in round strand rope) and adjustments necessitated by this cause are practically negligible. Also, when a new installation of winding gear is being considered, this type of rope demands consideration, as where a locked coil winding rope is adopted, and thus a smaller rope can be used, there is a corresponding saving in the drum width and size of the winding plant; in fact, it has been estimated that in this [illegible] saving of 10 per cent. may be effected.

[illegible] original method of constructing locked coil ropes, namely, with alternating direction of lay of each concentric [illegible] a consequent twisting of the wires in use, and this method has now been considerably improved upon by the writer's firm, who have eliminated this most dangerous feature. The locked coil rope in its improved form provides a satisfactory solution to [illegible] problems [illegible] for raising maximum loads from great depths it is unrivalled. A large number of these ropes [illegible] are giving satisfactory [illegible]. Among those may be mentioned particularly [illegible] of the circumference,

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having a breaking strain of over 300 tons, and which carries a total dead weight of 35½ tons. A locked coil rope of 6¼ in. circumference has recently been taken off after raising nearly a million tons of coal from a deep pit; while another rope, of 6¾ in. circumference and over 1,000 yd. in length, is giving satisfactory service under most strenuous conditions.

Naturally, to obtain such results great care has to be exercised in the manufacture of the ropes, and considerable progress has been made in this direction. The question of internal lubrication has received particular attention, ropes being now packed with a special compound of suitable viscosity as they are built up, the final concentric layer forming a complete lock, so that the inside portion of the rope may be regarded as working in a bath of grease. This lubricant cannot escape, and it not only prevents the entry of moisture, dirt and corrosive fumes, but reduces the internal friction of the inside wires, whilst, owing to the special method of laying up the rope, the insidious danger of cross-cutting, before referred to, is avoided.

Triangular Flattened Strand

Whilst the locked coil winding rope is undoubtedly the most suitable for new installations, it often happens that when an existing colliery is being re-designed to produce a greater output, or it has become necessary to wind from a greater depth or carry a heavier load a stronger and better rope is required. Under these conditions the existing round strand rope may be replaced to advantage by a compound triangular flattened strand rope, and this type is also sometimes adopted for new plants. It is also recommended for use in South Africa, where winding conditions are much more involved than in Great Britain, owing to the use of compound shafts and indirect leads from drum to headgear sheaves: as in many cases the rope winds on its own parts, a rope of the triangular flattened strand construction will successfully withstand the crushing effects of the various layers.

The compound triangular flattened strand rope is composed of strands which, being built up in a triangular shape, fit in "keystone" fashion into the rope. By this means a greater cross-sectional area is obtained, resulting in the rope being 12½ per cent. stronger than a round strand rope of equal size. The surface of the strands exposed for wear is therefore much greater, so that frictional wear is distributed over a number of wires instead of on the crown wires only, as in round strand ropes, the result being a longer life service. In addition, this type of rope, owing to its special construction, possesses valuable non-rotating and non-stretching qualities. These ropes have been supplied in all sizes up to 6¾ in. in circumference; they almost invariably give the full period of use permitted by the law, and, when removed, appear to be little the worse for wear.

In addition to this type of flattened strand rope, there is a concentric non-rotating flattened strand rope, which consists of concentric layers of flat strands so laid up as to effectually prevent any rotation of the rope in use, and by this method increased solidity and strength are obtained. This construction has been found invaluable for conditions where locked coil ropes cannot be used, and for winding on the Koepe principle they have been found to be the most satisfactory type.

Guide and Balance Ropes

Improvements have also been brought about in pit shaft ropes and for this purpose the use of locked coil guides, in either half or full locked construction, is recommended. These guide ropes are much more economical in use than the old types, as not only is a greater and better surface presented for wear, but they have the enormous advantage that in the event of a rod breaking, it is held in place by those adjacent to it, and thus prevented from catching the cage, with possibly disastrous results. In addition to this, modern practice has demanded a type of guide rope for use at great depths, which will carry the load necessary to keep it taut, in addition to its own weight. This necessitates the use of high-tensile steel, instead of the mild steel or iron previously employed, and it is obvious that this could only be safely employed on the locked coil construction.

The same remarks apply to rubbing ropes, which are placed in the centre of the shaft with the object of preventing a collision between the cages as they pass.

Flexible locked coil ropes are now preferred to all others for shaft scaffold guide ropes, for which purpose they are particularly suitable.

For balance ropes, for attachment to underside of cages, flexible mild steel round strand ropes of ordinary lay, or flat ropes can be used, but non-rotating flattened strand ropes are recommended, as they will give better service under any conditions.

Haulage Ropes

The problem of how to overcome the excessive frictional wear on haulage ropes, whilst at the same time obtaining a stronger rope, has exercised the minds of rope manufacturers very considerably, especially where the rope winds upon itself on to a drum. After experimenting with many types of rope, a triangular flattened strand rope of a modified type has been developed for "drift" haulage, and this has proved to be vastly in advance of any type of round strand rope yet devised. The increased wearing surface obtained by the flattened strand construction, combined with resistance to crushing on the drum, together with a higher factor of safety due to its increased strength, makes this type extremely successful, so much so, that many large concerns have now adopted compound triangular flattened strand haulage ropes on all their "slants."

Important economies have also been obtained by the use of flattened strand haulage rope for endless or main-and-tail mechanical haulage, as for the former purpose the "keystone" formation resists the crushing effect of the grips, rendering a wire main unnecessary, and therefore the rope can be made lighter and more flexible.

Aerial Ropes

Many mining concerns now employ an aerial ropeway for the handling of minerals, etc., or for the disposal of waste products; and these are usually of the bi-cable type—a fixed rope upon which the carriers run, drawn by a smaller haulage rope. In the early types of carrying cables used, viz., spiral and early locked coil ropes, the pressure of the carrier wheels upon the main cable caused considerable internal cross-cutting, while the vibrations caused by haulage gave rise to crystallisation and fatigue in the material near to the support.

These drawbacks have now been successfully overcome, and the present type of locked coil rope supplied for aerial ropeways has large external wires to take the

wear, is free from cross-cutting internally, and the material, being of special toughness and ductility, is not subject to crystallisation, whilst the internal wires are efficiently lubricated. Full-locked ropes are recommended on account of their greater smoothness, which reduces tractive effort, and because the ropes may be worn down much further than the half-lock type; the latter is often preferred, however, on account of its lower initial cost.

Conclusion

In the course of designing and the manufacture of these super-ropes an enormous amount of valuable experience has been obtained, together with data of far-reaching importance that has repaid to some extent the enormous cost of exploiting and testing the different types, a labour entailing the investigation of working conditions on the spot, much research work, the use of special materials hitherto unused by wire rope makers, and the building of special machinery to improve constructional methods. That this expense was justified is proved by the fact that ropes of these special constructions are now being adopted generally by discriminating users of wire ropes, and that the old types of ropes with their various imperfections are being superseded for mining operations except for some important purposes.

THE EVERLASTING METAL

The *Granby News,* of Anyox, B. C., addresses the following to its readers, the employees of the Company:

A short time ago the management of the Granby Company distributed locally a number of copies of a splendidly illustrated brochure entitled "The Story of Yesterday and To-Day." It was published by the Copper and Brass Research Association, of which the Granby Company is a member, and had to do with the history of the metal which is being produced in Anyox, illustrating a great many of the uses to which copper has been put in connection with the modern progress of mankind, as well as bringing graphically to our notice the fact that copper was a very considerable factor in the life of man at the earliest period of the world's history so far unfolded by the earnest seekers after truth in places where evidence of ancient human life are to be found. Its alloy with tin was the first metallic compound in the use of mankind; and so extensive and characteristic was its employment in pre-historic times that the epoch is known as the Bronze age, occurring between the periods of time known as the Stone and Iron ages. A piece of copper pipe unearthed at Gizeh, near the tomb of an Egyptian king, is said my Egyptologists to be at least fifty-four hundred years old; while the life-size statue of King Tut-Ankh-Amen, a discovery fresh in the minds of everybody, and guarding the entrance to his sepulchre in the valley of the gone Egyptian monarchs, is topped with the symbolical headdress made of copper and affected by the ancient Pharoahs.

The record of this metal on the scroll of the centuries is the record of human progress; and because of its resistance to all the agents of destruction following in the wake of time, it is alone worthy of the appellation applied to it—Everlasting Metal. Until the end of time, it must continue to serve mankind; and while temporary substitutes may take its place from time to time in certain quarters, because of cheapness and false testimony nothing can take its place where service continuous and lasting, is the main consideration. It is not economy to pass up an article of copper or its compounds because an article which will serve the same purpose for the time being can be had at a slightly cheaper cost. When in doubt about this, look ahead to the time when it will be necessary to renew the purchase of the substitute, not once but probably several times for the requirements of a lifetime, and you will appreciate which is the cheaper article in the long run—the one made of copper or the one offered "just as good." It is false economy to purchase cheap goods of any description. An article cannot be cheap and good at the same time. You know that there is no worthy substitute for the metal you are assisting to produce in Anyox; and if you have no immediate reasons to "Buy Something Made of Copper," people in other places may have and not know the difference between the genuine and unworthy substitute. Advertise the virtues of the metal wherever you find listeners, for people are ever eager to listen to truths when backed by undisputed facts.

COMPRESSED AIR DATA

A pamphlet entitled "Trade Standards Adopted by the Compressed Air Society" has just been published, embodying the result of extended study and research on the part of the executives and engineers associated with the members of that organization. It embraces the nomenclature and terminology relating to air compressors and their operations; a history of the development of speeds of air compressors; an explanation of capacities and pressures; instructions for the installation and care of air compressors with illustrations of devices suggested for cleaning the intake air; recommendation for the lubrication of air compressing machines and the cleaning of air receiver piping; a description of the low pressure nozzle test recommended by the Society, and a partial list of applications of compressed air.

The Compressed Air Society publishes this pamphlet with the belief that there is a need for such an authoritative work of reference and that compressed air engineers and users as well as manufacturers of air compressors will appreciate this step toward the establishment of definite trade standards in the industry.

Copies may be had from the members or by addressing the Secretary of the Society, C. H. Rohrbach, 50 Church St., New York.

RECORD MONTHLY OUTPUT FOR RAND

In October the gold output of Rand mines totalled 793,842 ounces. This constitutes a record month for the Rand, with the exception of a month in 1912, when a special clean-up brought the total to about 8,000,000 ounces. October's fine showing is attributed to an augumented supply of native labour, as well as a market all-round increase in efficiency.

METAL MARKETS

Consolidated M. & S. Co.

Bar Silver Prices

Average for week ending Dec. 25th.

London . . . . . 30 1/4d.
New York 64 3/8c

THE MINING DISTRICTS

By THE JOURNAL'S CORRESPONDENTS

BRITISH COLUMBIA

Tidewater Mine Closed. — The Tidewater Copper Co., operating on Sidney Inlet, Vancouver Island, has ceased work. Forty-five workmen reached Victoria early in December with cheques aggregating $8,000 in face value, payment of which was refused by the banks. Liens have been obtained against the property on behalf of the men under the Mechanics' Lien Act. The plight of the men was made the subject of debate in the British Columbia Legislature, now in session, when the Attorney General stated that the last shipment of concentrate from the Tidewater company, valued at $41,000, had been held up and that the government had advanced $3,000 to meet the immediate needs of the unpaid workmen.

Stewart.—More high-grade ore is reported to have been struck in the Dunwell Mine, Portland Canal. It was uncovered in the No. 2 Tunnel and is said to be similar to some of that taken from surface cuts, samples of which ran $90 in gold and 100 oz. in silver per ton.

The Canadian and American mining towns of Stewart and Hyder, Portland Canal, have been connected by road, the Public Works Department of B. C. announces. The old thoroughfare was partly over water; the new ore has been cut through rock for about one and a quarter miles.

The Porter-Idaho Syndicate, which has been organized with an authorized capital of $150,000 to take over the Idaho Group, situated at an elevation of 4,800 feet off the north branch of the Marmot river and six miles from tidewater, will proceed with the development of this promising prospect. The par value of the shares is $10 and the owners receive 8,400 of them, the remainder going to the treasury to be sold as funds are required. Some 375 feet of underground work has been done and a two-foot vein has been exposed for 28 feet. Assays of samples taken every five feet have run from $227.39 to $394.86 a ton, the principal value being in silver.

Dale L. Pitt, general manager of the Premier Gold Mining Co., is reported to have been appointed general representative of the Guggenheim interests in British Columbia with headquarters either at Stewart or Prince Rupert. Besides their interests in the Portland Canal district, the Guggenheims are operating at several points along the National Railways System, northern British Columbia.

Slocan. — William W. Buchanan, manager of the Meteor Mine, Slocan City, reports that shipments from this mine will be resumed in about two weeks. It is stated that a body of high-grade ore was uncovered recently.

The judgment given against Clarence Cunningham, a prominent mining operator of the Slocan district, by the lower courts in favor of Robert Insinger, a banker of Spokane, Wn., with reference to the purchase of the Hewitt and Lorna Doone mines, Silverton, has been confirmed by the Supreme Court of Canada. On August 15, 1918, Cunningham agreed to purchase these properties for $175,000. He paid $50,000, instead of half the purchase price as arranged, and was granted an extension of his option to purchase conditional upon undertaking certain tunnelling work. Before the option expired Cunningham notified Insinger that he did not intend to make further payments and the option was cancelled. In the B. C. Supreme Court the plaintiff, Insinger, was awarded an accounting of monies due him under the purchase agreement and damages for the development that should have been done on the extension of the option.

Trail Ore Receipts. — Ore receipts at the Trail smelter, Consolidated Mining and Smelting Co. of Canada, for the period November 22nd to 30th, totalled 9,771 tons. The shipments in detail follow:

	Tons
Alamo, Alamo	[illegible]
Company Mines	[illegible]
Gerrard, Trout Lake	[illegible]
Knob Hill, Republic, Wn.	112
Liberty Group, Zwicky	[illegible]
Lone Pine, Republic, Wn.	225
Paradise, Invermere	[illegible]
Pegleg, Slocan City	[illegible]
Quilp, Republic, Wn.	[illegible]
Republic, Republic, Wn.	[illegible]
Slocan C., Slocan City	2
Silversmith, Sandon	[illegible]
Standard, Silverton	67
Trevitt, Republic Wn.	[illegible]
Van Roi, Silverton	47
	9,771

Iron Bounty to be Renewed.—For some years British Columbia has offered a bounty of $3 a ton on pig iron manufactured in the province from domestic ore and $1.50 a ton on pig iron manufactured in the province from foreign ore. The bounty, as the statute now reads, expires on the 31st of December, 1923. It is understood that legislation is to be introduced extending the period of the offer at the present session of the legislature. It is possible that the provincial government will sponsor further legislation designed for the encouragement of the establishment of an iron and steel industry in the province. Just how far this will go cannot be said, but at least it will be an indication of the desire of the administration to support, as far as it is able financially and in other respects, any private interests, British or American, who may contemplate investment in such an enterprise in British Columbia.

COPPER PLANT CLOSED

Recently the copper smelter at Messina in South Africa, was fitted with apparatus for firing with powdered coal. The coal used is high in ash, and the furnaces were burnt out and now are shut down for repairs. It is possible that on account of the relatively poor quality of the coal available converters may have to be substituted for the present reverbera- tories.

NOVA SCOTIA

New Shaft being Completed. Number 14 shaft Dominion Collieries, Glace Bay, is timbered and completed and temporary cages are being put on to hoist rock from the pit bottom, which is being put into shape for output. As this shaft was not put down on virgin coal but on a section that previously had been worked, although at this point strong pillars had been left to support the long projected shaft, the pit bottom required has been strongly supported and reinforced.

The shaft pillars and roadways in the vicinity of the shaft are lined with concrete from twelve to eighteen inches thick. The roof is supported with 10″ Bethlehem steel H sections. For a short distance on either side of the shaft, the approaches will be twenty-four wide. This section is supported by 18″ steel beams resting on twelve-inch columns and tied with floor beams. The pit bottom is one-third completed and is expected to be ready by May or June of next year.

The main haulage way, which is 9,000 ft. long, is about one-half completed. Roads have been graded, the roof blasted down and pack-walls built a distance of 4,000 feet. Of this, 1,000 feet has been faced with concrete and this work will be carried on to the inner turn-out. As this is to be the first real experiment with electric haulage, everything is being done with the object of safety and permanency. Nothing is being left to chance. Provision has been made for stone-dusting the many haulage ways as a preventive against coal-dust explosions.

There will be two miles of track, 60-lb. rails for electric locomotive haulage, 30-lb. rails will be laid on subsidary haulage ways such as levels and headways and 20-lb. rails in rooms. These are 5 pounds heavier than any other colliery because the pit box will be of greater capacity and will, when loaded, be slightly over three tons.

It was intended at the beginning to put in electric mining machines, but it has now been decided that, for the present, air coal-cutting machines will be continued. Those now in use are the Ingersoll and the Radial. Experiments are being made with the Mavor and Coulson and the Hardy, but the type to be in general use has not been selected.

The mine will be equipped for an output of 2,000 tons, which later on will be increased to 2,500 tons. For a number of years two-thirds of the output will be drawn from rise workings. The main levels will run towards the sea.

Wage Negotiations Progressing Satisfactorily. — A sub-committee composed of representatives of the Executive officers, District No. 26, U. M. W. of A. and Besco colliery officials, with the help of Mr. F. W. Gray, drew up the basis of an agreement, to be put into force provided an understanding is reached on the wage scale. It took a few weeks to put the agreement in shape and to make it clear and cover all the conditions at the collieries; but the committee believe they have got somewhere near to what they aimed at, and look upon it as the first real agreement made since the United Mine Workers of America began to regulate labor affairs in Nova Scotia. The wage discussion will go over until after the holidays, when it will be taken up again with the purpose of being ready by January 15th.

At present there is much idleness at the collieries and it is generally believed that, until a satisfactory agreement is reached, it will continue, as no large coal contracts can be booked until the Company know what the cost of coal is going to be. If the men and the Company are able to get together, Cape Breton will, no doubt, have a good year. There will be no labor interruptions, as these are guarded against in the basis of the agreement. There will be nothing but new local conditions that may arise to deal with, and these also are covered in the contract. Let us hope that by the middle of January the miners of the Province will know that a good year's work is ahead and they have done their own part in bringing it about.

Steel Plant and Collieries Slowing Down. — There is a further slowing up in the steel and coal trade of Nova Scotia and there is much idle time at the collieries. The mines with the best quality of coal are getting the best of the work. This is rather hard on the workmen who find themselves in a district where the coal is of an inferior quality; not that there is much of this inferior coal, but it is not good metallurgical coal and when the outside market for domestic coal is satisfied, the home market cannot take it.

The steel plant, Sydney, is laying off a large number of men. Expected orders have not yet come in and the Company will not stock its products so heavily this year as last. Last winter 35,000 tons of rails were rolled, to give employment, and these were kept on hand for several months. This effort was not appreciated by the workmen, who by their actions added to the cost of production.

The Year's Coal Output. — The Coal output of Nova Scotia for 1923 has been 5,317,000 tons, against 4,457,000 tons in 1922. Every coal-mining county shows an increase. Especially in the latter half of the year the daily outputs were large and indicated the increased capacity of the collieries. An analysis of the first six months' output in Cape Breton county is very interesting, and from an industrial standpoint illuminating, as to the disastrous effect of a coal strike. The total output of the first six months for the Dominion collieries was 1,876,967 tons. Compared with the first six months of the previous year, when "striking on the job" was encouraged, the increase was over 700,000 tons. Compared with the last six months of 1923, after the July strike, when contracts of 400,000 tons had been cancelled because of the strike, the increase was only 393,273 tons, and this at a time when each succeeding month showed very large daily outputs.

Output Capacity, 7,000,000 tons. — The collieries of Nova Scotia are in a position to give an output of 7,000,000 tons in 1924 if trade demands it. With a reasonable agreement signed up between the coal operators and the United Mine Workers (and there are strong grounds for believing this will come), 1924 should, if prices are right, put the coal trade of the Province on its feet. There is much need of a quiet, busy year when both labor and capital will unite to

SALES OF CALCIUM ARSENATE

At a meeting in New York recently of those interested in the arsenic trade, it was disclosed that the consumption of calcium arsenate was doubled during the past season, being about 31,000,000 pounds. It was estimated that, if the price next year were reduced to 11 to 13 cents a pound, the demand would be from 65,000,000 to 75,000,000 pounds, while at 16 cents, the amount sold would be [illegible] to 40,000,000 pounds.

SOME USES OF QUARTZ

In its annual report on the mineral resources of the United States, the Geological Survey gives the following description of the uses of silica:

Miscellaneous Uses of Silica

Silica is used for many purposes, principally in the manufacture of pottery, paints, and scouring soaps, as a wood filler, as a polisher, and in metallurgical and chemical processes. In the pottery industry, where it is generally called flint, silica is used in the body of the ware to diminish shrinkage and is also used in glazes. Silica for use in pottery should contain less than 0.5 per cent of iron-bearing minerals. Manufacturers of paint use considerable quantities of very finely ground silica, which forms as much as one-third of the total pigment in some paints. For this purpose finely ground crystalline material is superior to fine sand in its natural state because of the angularity of the grains, which makes them adhere more firmly to the article painted and after wear affords a good surface for repainting. The same angularity makes artificially comminuted crystalline quartz superior to natural sand for use in wood fillers. For soaps and polishing powders ground material is preferred to natural sand on account of its whiteness and angularity. For all these purposes large quantities of pure quartz sand and sandstone are finely ground and yield a product fully equal to that obtained by grinding massive crystalline quartz.

Quartz crushed and graded to various sizes is used in making sandpaper and sand belts, as a scouring agent, for "frosting" glass with sand-blast apparatus, and for other purposes. Blocks of massive quartz and quartzite are used in the chemical industry as a filler for acid towers and as a flux in copper smelting. Ground quartz is also used in filters and in tooth powders and by dentists as a detergent.

The material known commercially in the United States as tripoli, which is the siliceous residue of decomposed limestone, also yields an excellent grade of pulverized silica, which is used for the same purpose as silica powder obtained from massive crystalline quartz and from sand and sandstone. Diatomaceous (infusorial) earth is also used to make polishing powder that is employed for similar uses to those for which quartz, sand, and tripoli powders are employed, but diatomaceous earth has somewhat different properties, and most of it finds different application, as insulating and filter material.

Sand and crystalline quartz have been used in making silicon and alloys of silicon with iron, copper, and other metals in the electric furnace. Quartz may be fused in the electric furnace to make chemical apparatus, such as tubes, crucibles, and dishes.

Quartz Glass

The making of quartz glass received its impetus from several directions. Chemists needed glassware, especially in the form of tubes that were more resistant to chemical reagents and to heat than any glasses of more complex composition. Mercury arc lamps, now largely used for water sterilization, require a tube that will stand a temperature in the neighborhood of 600 deg. C. The application of ultra-violet rays also demands clear glass rods and tubes, and chemical manufacturers need large tubing that is resistant to heat and to corrosion by hot gases and vapors. For some chemical work glasses do not need to be clear, but the glass used in mercury arc lamps must be transparent. Most quartz contains bubbles of air, water, carbon dioxide, or other substances which, on heating, become greatly enlarged, and when molten the quartz may appear satiny from the great number of bubbles, which were almost unnoticeable before. For those uses in which it is not necessary to have a transparent glass, a pure quartz sand furnishes a good raw material, but for transparent glass only the purest quartz in large pieces can be used, so that the difference in the price of glass free from bubbles and that containing only comparatively few bubbles may appear disproportionately large. Another reason for the greater cost of the transparent glass is the great loss through volatilization of melted quartz. A charge of 5 or 6 pounds of quartz is melted in less than 20 minutes in an electric furnace, but in that time it loses 20 per cent by volatilization. If the charge is sand or some other cheap grade of quartz, such a loss means little, but with a charge of high-grade Brazilian pebble the loss is more serious.

The first quartz glass was all formed by hand, and handwork is still used for crucibles, breakers, and similar ware. Tubing and rods, however, are now made mechanically of various sizes and lengths. An extremely clear glass is made by the General Electric Co. at Lynn, Mass., where Dr. E. R. Berry has conducted experiments for the last seven years and where a large quartz-glass plant was to be constructed during 1923. The quartz used for the glass is the best Brazilian pebble, carefully treated with acids so as to remove all traces of iron and other soluble materials. Dr. Berry has so far solved his problem that he is able to make mechanically tubes and rods of definite sizes.

Difficulties of Manufacture

One of the greatest inducements for the working out of mechanical methods of quartz-glass manufacture has been the difficulty in developing and handling skilled workmen in quartz glass. When heated to the melting point quartz glass is so incandescent that the light it gives is too dazzling to allow the glass to be worked by direct vision, so that in general it is worked by men wearing dark spectacles, and between them and the work is a dark plate glass plate. Little of the work that is not incandescent can be seen through the spectacles, and as only small parts of the glass can be kept heated in the small oxy-acetylene flames used and it is necessary to examine the glass more closely at frequent intervals, the spectacles must be removed and the work allowed to cool. These difficulties make the work extremely trying and introduce complications in directing such labor.

In making tubes for mercury arc lamps it is necessary that the tubes be welded with glass that can be worked at lower temperatures, and this is accomplished by making a mixture of quartz and "pyrex" glass, which changes regularly from pure quartz to pure "pyrex." Quartz-glass tubing is now made in diameters reaching several inches and in complex coils, for the condensation of acids and other hot fumes.

Uses of Quartz-Glass

In the mechanical making of clear-glass tubes and rods very heavy gas pressures are sometimes used, and the rods and tubes are extruded directly into water. The resistance of quartz glass to extreme changes in temperature is one of its most valuable qualities. Rods and tubes 26 feet long have been made by the General Electric Co., and the rods are so transparent that when a burning match is held at one end the light emerges at the other end apparently almost undiminished. Its remarkable transparency, its hardness, and its high index of refraction make quartz glass a very desirable material for lenses, and Dr. Berry hopes to be able to obtain it free enough from bubbles to make telescope lenses.

Quartz glass is useful in ultra-violet ray work because it is transparent to the rays, whereas ordinary glasses are opaque. This property of quartz glass has been utilized in making mercury arc lamps for the sterilization of water supplies and for the treatment of disease. Swimming pools in which it is not easy to change the water are equipped with one or more of the arc lamps, depending on the number of bathers and the size of the pool. The lamps are placed in a trough through which the water is constantly pumped. It is said that two lamps will thoroughly sterilize and keep sterile water in a pool in which several hundred persons are bathing. One pool on the East Side in New York in which two lamps were operated and in which the water was not changed during an entire season is said to have shown less live germs at the end of the time than the water contained when it was drawn from the city mains.

Ultra-violet rays are used in the treatment of wounds and diseases of the jaws and nasal passages. Two forms of apparatus have been used. In one form the rays were applied through a hollow cone of quartz glass having most of its surface covered with a metallic film, leaving only the point through which the rays passed. It is difficult to apply such an apparatus to the inside of the mouth, and therefore another form has been devised in which solid rods of transparent quartz glass are attached directly to a small water-cooled mercury are that is easily held in the hand, and the rods are bent to suit the portion of the mouth to which the rays are to be applied. The rays will follow the rod, as a fluid follows a tube, and leave the rod at the end.

USES OF BARITE

Barite is used as a finely ground powder in combination with zinc as lithopone, and to make as miscellaneous barium compounds.

Barytes is ground to very fine powder, leached with acid, and washed for use as a pigment, a filler, and an inert base. Most barytes is refined by flotation on a stream of water, whereby only the most impalpable powder is obtained. As a pigment it is used chiefly in interior flat white or light-colored paints. As a filler it is extensively used in rubber goods, linoleum, oilcloth, highly glazed paper, and similar white glazed articles. It forms an inert base on which dyes are precipitated to make lakes or colored paints. Ground barytes has also been used in making brick for the construction of X-ray laboratories, in place of a lining of sheet lead, to prevent the rays from escaping and doing possible injury.

Lithopone is a pigment prepared chemically from barytes and zinc. It is an intimate mixture of chemical precipitates of barium sulphate and zinc sulphide in the proportion of about 70 per cent. sulphate and 30 per cent. sulphide. It is of exceedingly fine grain and is used not only in paint but as a filler in rubber goods, linoleum, oilcloth, window shades and certain kinds of paper.

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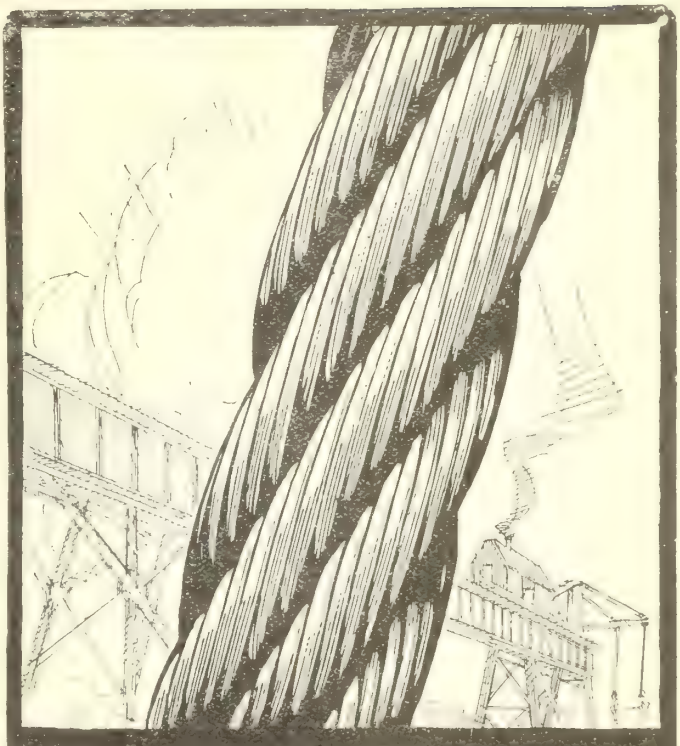

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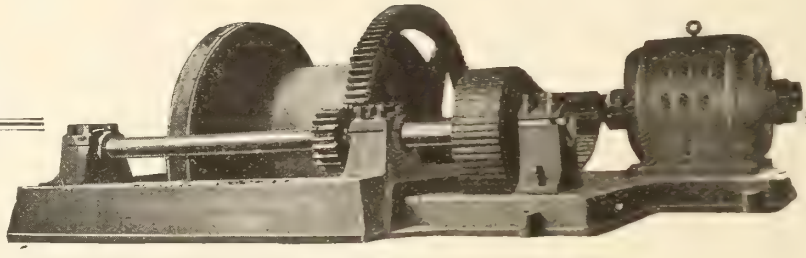

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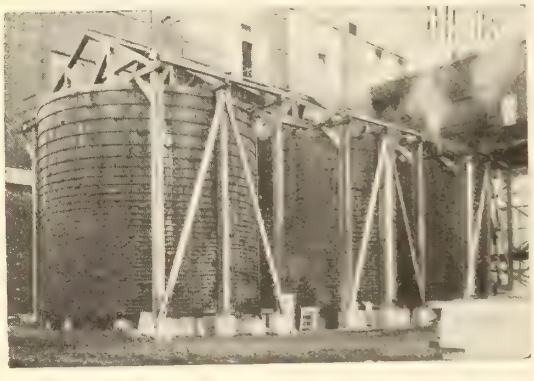

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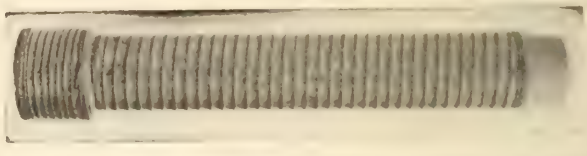

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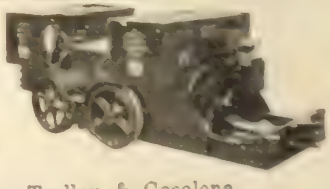

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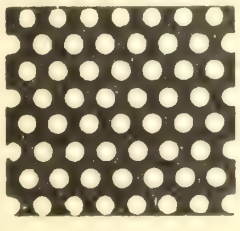

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Allan Whyte & Co.
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Hadfields, Limited
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Lammers & Maase, Ltd

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Hore, R. E.
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